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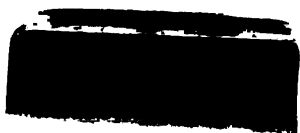
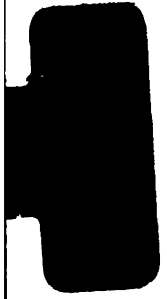
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S U P P L E M E N T
TO THE
ANNUAL REPORT
OF THE
State Engineer and Surveyor
OF THE
STATE OF NEW YORK

For the Fiscal Year Ending September 30, 1905



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HISTORY
OF THE
CANAL SYSTEM

OF THE
STATE OF NEW YORK
TOGETHER WITH
BRIEF HISTORIES OF THE CANALS

OF THE
UNITED STATES AND CANADA

VOLUME I

BY NOBLE E. WHITFORD

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UNDER AUTHORITY OF HENRY A. VAN ALSTYNE,
STATE ENGINEER AND SURVEYOR

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INTRODUCTION.

New York State canals have made much history. Their tranquil waters have borne the commerce which early placed the State in the first rank of the Union and gave to its growth such an impetus as to maintain it in that proud position. They made possible the speedy development of the interior and have largely influenced the prosperity of the whole nation. For many years their monetary struggles dictated the financial policy of the State. They precipitated the calling of at least one convention for constitutional revision, and have occupied a large place in the deliberations of the others. They have occasioned the rise and fall of statesmen and have often dominated the policies of political parties, governing their successes or failures. In short, the story of their existence is so closely interwoven with that of the State as to form one of the most important chapters in the history of that commonwealth.

The need of a book, like the present volume, has long been felt by those interested in the affairs of the New York canals; and the present time, when the State is entering a new era in its canal history, seems eminently fitting for writing the story of the canals, which for nearly a century have played so large a part in shaping the history of the State, inasmuch as nothing of this character has been attempted since the publishing of the *Canal Laws* in 1825, the nearest approach being the *Documentary History of the Canals*, by Sylvanus H. Sweet, which is now forty-three years old and was prepared in so short a time as to be deficient in many essentials, especially in the matter of arrangement for easy reference. It cannot be hoped that the present volume will not also be lacking in many details. Indeed the field is so vast that to cover it completely would require both a much longer time for preparation than is now available and a work of many volumes. However, the attempt has been made to record, in historical sketches, the most important events, and to furnish in a chronological résumé and in a general bibliography the means for

further investigations. Necessarily this history is largely of a documentary nature, for the records of legislative enactments and of work accomplished have been preserved in the archives of the State, while the causes which produced, and the results which followed this great enterprise are often recorded only in the development of the Nation and in the lives of its people. Fortunately the public documents, the best sources of history, have been kept, and the people of New York State are not open to such criticism as are the builders of the Languedoc canal, the greatest model of canal-building before the time of the Erie. The most authentic history of that undertaking was not written till 1800, one hundred and twenty years after its completion, when many important details could not be obtained, the writers of the time of Louis XIV having busied themselves with describing the intrigues and splendors of the court, rather than with matters of economic and industrial importance. This criticism is also true of the ancient works of improvement, for while historian, orator, and poet join in depicting some gorgeous feast or in singing the praises of a king's favorite, they have left us little but the names of the old canals.

The aim in preparing this volume has been to make a book of reference, which may be used in answering the questions that are constantly arising in the several departments of the State Government, to enable the State officers to know just what the State's rights were to the use of lands and waters connected with the various portions of the canal system, and also to produce a history of the canal system of the State, giving the important events connected with the various canals, which can be used by those who do not require the minor details. To serve both purposes at the same time is difficult, but the endeavor has been to emphasize the feature of the reference book. Not to burden the text with too much detail, resort has been made to a table of laws and events, arranged chronologically, and carefully indexed, to make it easily available, and also to a bibliography of publications dealing with the canals. Beyond a few brief statements, no attempt has been made to tell of events relating to the Barge

canal after the time when that work was authorized by the referendum of 1903. The history of that enterprise is reserved for some future report. Another field, not exhaustively covered, but one in which perplexing questions are constantly arising in the State departments, is concerned with the acquiring of land and water rights and the awards for damages sustained by reason of the canals.

As far as possible all facts have been traced to original sources of information, and in many instances, especially outside of State documents, these sources are indicated either in foot-notes or otherwise. However, the origin of a large majority of facts, which have been obtained from the annual reports of State officials, is given only by inference. Care has been exercised to make quotations the exact reproductions of originals—in diction, spelling, capitalization, punctuation and all forms of typography except the use of old-fashioned letters, any explanatory insertions or changes of tense being inclosed in brackets.

The book is divided into five parts, the first three dealing with the New York State canals. Part Four is a compilation of statistics relating to canals which have been built in the United States and Canada. Such a work has never been published in English, and its need has become apparent. A book of this nature, entitled *La Navigation aux Etats-Unis*, was issued as a report to the French Minister of Public Works by H. Vétillart, Engineer-in-chief of Bridges and Causeways. A somewhat similar book has been published in German.

In compiling Part Four, all available sources of information have been used, but chiefly National and State reports, the libraries at Washington, New York, Philadelphia and Albany having been visited for this purpose. Dr. Elmer L. Corthell, M. Am. Soc. C. E., has personally collected considerable information from State Governments along this line, and he has kindly allowed the use of this material. In investigating the records, there were discovered wide differences in statistics, which were derived from sources that should be considered authentic. Where this occurred a choice was sometimes made, and in other instances the several figures are given with their sources.

To complete the work, portions of a monograph issued by the United States Department of Commerce and Labor in 1905 and entitled "Great Canals of the World," are reprinted in Part Five, permission having been given by Mr. O. P. Austin, Chief of the Bureau of Statistics.

* * * * *

That the practice of canal-building is very ancient cannot be doubted and that the people of a remote antiquity built great artificial channels and were followed by successive generations of canal-builders for thousands of years before the seemingly essential canal-lock was invented, is readily seen from a brief review of their works.

The first artificial waterways in the world's history date from an immemorial past. According to one authority¹ they certainly reach back to 3500 B. C. and more probably to at least 7000 B. C. These were the channels for irrigation and drainage, used to regulate the overflow of the rivers in Babylonia and Egypt. When these were first used for navigation and when the first canals were built primarily for navigation cannot now be told, but probably at a very early date. According to tradition, the Suez canal was excavated prior to 2000 B. C. It was certainly open for the navigation of small vessels by 600 B. C. and remained in operation for fourteen centuries. At about the same time the Royal canal of Babylon was opened between the Tigris and the Euphrates. It is generally believed that China had canals before the Christian era, but evidence is lacking. Under the Roman Empire several canals were constructed; one in 102 B. C. from the Rhone to the Mediterranean, built by Marius, and another from the Tiber to the sea, constructed under the Emperor Claudius. During their control of England, the Romans built two canals in that country, the Caer Dyke, and the Foss Dyke, in Lincolnshire, of eleven and forty miles, respectively. Of the former, only the name remains but the latter is still in use as a navigable canal, having been deepened in 1121 by Henry I, and restored to a state of efficiency in 1840. In the fourth century, the favorable topography of Lombardy led to the canalizing of that country, and near the end of the fifth century Odoacer's canal from the Adriatic

¹*Encyclopedia Americana*.—Canals.

sea to Mentone, near Ravenna, was constructed. After the cessation of Roman supremacy this form of public improvement slumbered till Charlemagne's attempt to connect the Danube with the Rhine and the Black Sea. The Imperial canal of China, completed in 1289, is said to be about a thousand miles long.

But before the invention of locks, the countries to adopt canals were those having comparatively level surfaces, like Babylonia, Egypt and Mesopotamia. The Netherlands also, where the channels were branches of the original sea, early instituted a system of canals. It must not be inferred, however, that all these waterways were constructed on one continuous level, for it appears that the early canals of Egypt and China were adapted to the varying contours of the land, having a form of inclined plane for transferring boats to successive levels. Even to-day the same contrivances are used in China on its ancient and extensive system of canals and canalized rivers.

But during all these centuries before the invention of the canal-lock, improvements of great magnitude were impossible, for either canals were restricted to level countries, or the capacity of boats was limited by the rude and costly methods—adopted in a few places—of transferring to differing levels. Viewed from our day of wonderful inventions, it seems almost unaccountable that the canal-lock so long eluded discovery. This is the more remarkable since the principle involved is so simple, the systems of early canals so extensive, the need of an easy means of inland transportation so patent, and the skill and achievements of ancient engineers along other lines so great. Without seeking to explain this circumstance we can simply accept the fact that this, together with the other branches of hydro-mechanics, is a comparatively modern science. Even the development of the canal-lock was so gradual that not only is its inventor unknown, but the land of its first adoption is in doubt, as well. Italy claims the honor for two brothers, engineers of Viterbo, in 1481, also for the versatile Leonardo da Vinci, engineer and painter. By some writers the discovery is attributed to Holland, a century earlier. However, it is definitely known that during the latter part of the fifteenth century locks were in use in both countries. Probably the lock was gradually developed

from a form of dam which Robert Fulton describes as being in early use in Flanders.² This consisted of a dam located below a natural fall and having buttresses with perpendicular grooves into which gates could be lowered, thus accomplishing the stoppage of the water till its surface rose to the level of that above the fall.

The introduction of locks opened such a wide field for improvements that canal-building rapidly spread throughout Europe, the French being the first to engage systematically and extensively. In 1605 they began the Briere canal, joining the Seine and Loire, and finished it in 1642, completing also the Orleans canal in 1675. The greatest work of that period was the Languedoc canal, connecting the Bay of Biscay with the Mediterranean. This canal, designed by Francis Riquet, begun in 1666 and finished in 1681, was an enormous undertaking for its day, and with its one hundred and forty-eight miles of length, its rise of six hundred feet above the sea, its numerous locks and aqueducts, its tunnel of more than seven hundred feet, and its capacity for floating barges of a hundred-tons burden, it stood as a monument to the skill and enterprise of its projectors, and as a model for canal-building for nearly a century and a half.

The conservative English people waited for almost a hundred years before following this brilliant example of French construction, but, when once aroused by the energy and liberality of the Duke of Bridgewater, the projector of the first canal of importance in England, they pushed the work with exceeding vigor, led by such famous engineers as Brindley, Smeaton, Watt, Jessop, Nimmo, Rennie and Telford. Indeed so prosperous was the era of canal-building that, from 1791 to 1794, speculation in canal shares became a mania in England, and resulted in a financial crash and the ruin of many.

With such examples throughout Europe and especially with such energy displayed in the mother country, it was but natural that the people of the American colony should perceive the need of similar improvements in the new land, where the field was so large, the coastwise trade so dangerous, and the opportu-

²*A Treatise on the Improvement of Canal Navigation*, by R. Fulton, p. 7. (London, 1796.)

nities for internal development so great. Americans, with their characteristic quickness, began the projection of canals within a few years after the commencement of active canal-building in England and within a half century they were in the midst of constructing extensive systems which were the equals of the best in the world. But though the opportunities were great, the difficulties were greater. The country was chiefly a vast wilderness, the resources were few and money for large undertakings almost unattainable. During the colonial period the restrictions imposed by England were almost prohibitive of any great enterprise. However, it is worthy of notice that several schemes for inland navigation were being agitated during the colonial period. The Revolutionary war interrupted, for a time, all thought of canals, but soon after its close they came to the front again. General Washington took the lead in projecting internal improvements, both before the war and immediately after, and had he not been called to the Presidency would probably have brought some of his schemes to successful fruition.

At certain seasons of the year the early coastwise commerce was carried on under especially dangerous conditions and as the rivers and bays along the coast are in many cases well adapted to the construction of canals to connect them, numerous projects were urged for that purpose. Indeed, by many, such a plan is still considered necessary. Only ten years ago a committee appointed by the City of Philadelphia reported favorably for the building of a coastwise canal of large dimensions.

Probably the first canal constructed within the territory of the United States was a short waterway in Orange county, New York, built in 1750, for transporting stone, by Lieutenant-Governor Cadwallader Colden, who in 1724, as Surveyor-General, had made the first report of the natural water communications of New York State. The first canal in North America, however, antedated this by fifty years, being an attempt at Lachine on the St. Lawrence, undertaken by Dollier de Casson, Superior at the Seminary of St. Sulpice.

The routes of navigation into the interior and to the western territory attracted the greater amount of attention and opened the larger field for development. The need of easy communication from the seaboard to the great inland lakes, and to the

valleys of the Ohio and Mississippi was early apparent. In the attempt to meet this need New York was particularly favored, "for," as said an early writer, "the Allegany mountains which pass through all the States, seem to die away as they approach the Mohawk-River and the ground . . . is perfectly level, as if designedly to permit us to pass thro' this channel into this extensive inland country."⁸ After the war, the pushing westward of the frontiers began in earnest, and this was followed by more determined efforts to facilitate the means of communication. The first efforts were generally directed toward improving natural waterways, but, with their imperfect methods of controlling the flow of streams, the results were usually far from satisfactory, and the builders were forced to learn the necessity of following the rule, which the English had adopted, of constructing independent canals. It is interesting to note the tendency of modern engineering practice back to the use of natural streams. In New York the line of the Barge canal follows very closely the old location of first improvements in the beds of the Mohawk river, Wood creek, and the Oneida and Seneca rivers.

At a time when we have ceased to wonder at stupendous engineering feats, which have furnished this continent with the means of rapid and easy transportation, it is difficult to realize the conditions that prevailed in America less than a century ago; we are prone to forget the magnitude of the undertaking which was the chief instrument in retaining for New York the proud title of Empire State; we lose sight of the tremendous difficulties overcome, and the strenuous efforts exerted by the men who gave to the State her canal policy. When we recognize the primitive conditions and review the difficulties, we do not wonder that the people of a struggling republic stood aghast at the vast enterprise, and were slow to begin improvements which have proved to be the making of the State.

Although the need of a canal was generally recognized, the magnitude of the undertaking and the fear of the State's ability

⁸Christopher Colles' *Proposals for the Speedy Settlement of the Waste and Unappropriated Lands on the Western Frontier of the State of New York, and for the Improvement of the Inland Navigation between Albany and Oswego*, p. 11. (New York, 1785.)

to cope with the difficulties developed a strong opposition, which, augmented by personal considerations, political affiliations, and differences of opinion, has marked the history of the canal throughout its entire existence. For years the project struggled along before sufficient public sentiment could be aroused to demand its fulfilment. People denounced it as visionary. Jefferson declared it a hundred years ahead of its time, saying that to think, at that day, of making a canal of three hundred and fifty miles through a wilderness was little short of madness. Madison thought that its cost would exceed the resources of the whole country, and refused to grant any National aid. Sister States, appealed to, sent nothing but their good will. For New York to undertake the work unaided was considered equivalent to dooming the State to bankruptcy. Even after it was begun, appropriations were obtained from the Legislature year by year with the utmost difficulty, and in derision it was said that in Clinton's "big ditch would be buried the treasure of the State, to be watered by the tears of posterity." It is well that at this period there were men guiding the interests of the canals who had a strong faith in their ultimate success, and who clearly foresaw the benefits to ensue. To their energy, fearlessness, inflexible perseverance, and dauntless resolution is due the era of prosperity and development which followed the building of the canal. Prophetically did the writer of the "New York Memorial" say, "It remains for a free state to create a new era in history, and to erect a work more stupendous, more magnificent, and more beneficial, than has hitherto been achieved by the human race."⁴

⁴*Canal Laws*, Vol. I., p. 140.

SYNOPSIS OF CANAL PERIODS.

In writing the history of so large a subject as the New York canals; many portions of the account must necessarily become a compilation of comparatively isolated and unimportant facts. Especially will this be true in a work of reference. In this volume, lest the epoch-making features be obscured by the mass of detail, a brief synopsis of the whole development of canals in New York State is here given.

A study of the progress of canal-building in Europe and America reveals three general stages: first, the early canals—usually of small capacity—before the advent of railroads, when waterways afforded the only cheap means of transportation; second, the original or enlarged canals in competition with the railroads,—the latter at first grew to be dangerous rivals, then gradually secured the bulk of the traffic, and finally began purposely to divert all trade in order to abolish the canals and destroy competition; third, the general reconstruction of waterways, brought about by a realization of the dangers resulting from the absence of competition in freight rates. This third stage was reached in Europe some twenty or thirty years ago; old canals were deepened—generally with the unprofitable branches omitted—and new channels were built, in the endeavor to provide waterways deep and large enough to permit cheap rates. In general, great success has attended these efforts; old industries have revived, new ones have sprung up, resources have been developed and commerce has been stimulated, eventually even to the benefit of the railroads. In America this third stage is just being entered. The United States and the Canadian governments have already made considerable progress, and now some of the states—New York in the lead—are beginning the work of reconstruction.

Aside from this general classification, the specific history of the natural and artificial waterways of New York state may be divided into seven periods, or stages, of improvement, which in turn may be subdivided into several smaller periods. These main periods, with their distinctive events, are as follows:

SEVEN MAIN PERIODS.

1609–1790. **THE PERIOD OF NATURAL STREAMS**; their use with but few artificial improvements; the later efforts to improve them, but without tangible results.

1791–1807. **THE PERIOD OF THE INLAND LOCK NAVIGATION COMPANIES' CANALS**; their construction and use while the people were coming more and more to realize the need of some adequate means of transportation.

1808–1834. **THE PERIOD OF THE ORIGINAL ERIE AND CHAMPLAIN CANALS**; the agitation which produced them; their construction; their marked success and popularity, which led to an eager desire for similar channels throughout the whole country, and which inaugurated the policy of constructing lateral canals in New York state.

1835–1862. **THE PERIOD OF THE FIRST ENLARGEMENT** of the main branches of the system and of the continuation of building laterals.

1863–1891. **THE PERIOD OF MINOR IMPROVEMENTS AND OF ABANDONING THE LATERALS**,—a period beginning with comparative quiet for a few years till the rapidly increasing competition of rival railroads and Canadian canals changed it into a period of agitation and of striving for suitable means of meeting that competition,—an effort which looked toward the later enlargements, but could find expression in actual works of construction only in such improvements as the introduction of successful steam propulsion, the lengthening of locks, the installation of machinery for hauling boats into locks and a few other betterments; a period also of abandoning certain lateral branches, of greatest freight movements and of their subsequent decrease, of abolition of tolls, of extravagant expenditures, of retrenchment and of the beginning of awakened interest in canals.

1892-1898. THE PERIOD OF THE SECOND ENLARGEMENT, from the time of the first legislative action to accomplish this end to the stoppage of the partly completed construction.

1899-the present. THE PERIOD OF THE THIRD ENLARGEMENT, of the Barge canal, from the appointment of a committee to formulate a proper canal policy, through the agitation for its fulfilment, to the beginning of the resulting work of construction.

NINETEEN SHORTER PERIODS.

These main periods may be subdivided into the following shorter periods:

1609-1768. The period of using the natural streams, with but few artificial improvements.

1768-1790. The period of awakening to the needs of improved navigation, during which the first official action appeared.

1791-1797. The period of constructing the Inland Navigation Companies' works.

1798-1807. The period of quiet before the people were ready to undertake the task which the conditions demanded.

1808-1816. The period of active canal agitation.

1817-1825. The period of constructing the Erie and Champlain canals and of beginning agitation for lateral channels.

1826-1834. A period of remarkable success attending the canals, during which the amount of traffic exceeded all expectations,—a success that demanded an enlarged channel, and induced the building of the Oswego, Cayuga and Seneca, Chemung, Crooked Lake and Chenango canals by the State and the Oneida Lake and Delaware and Hudson canals by private enterprise. A period of growth of railroads, also, so that not only were an enlarged channel and a ship canal proposed, but railways to supersede the canals were suggested.

1835-1841. The period of beginning the first enlargement of the Erie, of constructing the Seneca river towing-path, of beginning the construction of the Black River and Genesee Valley canals and the Oneida River improvement and of purchasing the Oneida Lake canal. In the midst of this period occurred a financial panic, which, together with the increased cost of the improvements and an inadequate plan of financing the enterprise,

so involved the State in debt as to require the stopping of all work, except that essential to preserve the integrity of the canals, until the monetary affairs could be adjusted.

1842-1846. Another period of comparative quiet,—so far as the work of construction is concerned,—while the Constitution was being readjusted in order to permit the resumption of operations on a more conservative financial basis.

1847-1853. The Constitution of 1846 permitted the interrupted work to be resumed, but under restrictions which led to legislative turmoil, through attempts to evade the constitutional limitations by selling the revenue of the canal in advance. Only another amendment to the Constitution could remedy this difficulty. During this period the Baldwinsville canal—built and operated for forty years by private enterprise—was appropriated by the State, and railroad tolls, which had been applied to the canal fund, were abolished.

1854-1862. Under provisions for borrowing needed money, the work of enlarging the Erie proceeded, with some interruptions for lack of funds, to a so-called completion in 1862. At the same time the Oswego and the Cayuga and Seneca canals were enlarged, and in 1860 a deepening of the Champlain to five feet was begun. Early in this period there was inaugurated the system of repairs by contracts, which was later to furnish material for sensational charges of fraud.

1863-1868. A period of few improvements, although a beginning was made toward completing the work left unfinished in 1862, and there was an active attempt to provide locks suitable for gunboats on the Erie, Champlain and Oswego canals. During the latter part of the period evidences of extravagance began to appear. Experiments in steam propulsion were claiming attention, the Chenango canal extension was begun and an attempt to enlarge the locks of the Oneida Lake canal resulted in beginning an enlarged canal on a new location.

1869-1875. A period of greater activity, after the release of the revenues from certain obligations imposed by the debt of 1846; of investigations into canal management, with far-reaching reforms, including the abolition of the contracting board and the contract system of repairs, the adoption of a policy of

retrenchment and a little later the substitution of a Superintendent of Public Works for the canal commissioners; of agitation which subsequently resulted in abandoning the Chemung, Crooked Lake, Chenango and Genesee Valley canals, and ultimately the Oneida Lake canal; and of active attempts to perfect steam towage. During this period a second deepening of the Champlain—to seven feet—was begun but never fully accomplished.

1876–1883. A period of retrenchment, but also of continued agitation for increased facilities for transportation, the “Seymour plan” of enlargement being enunciated. During this time the tolls, after having been repeatedly reduced since the building of the canals, were finally abolished.

1884–1891. The period of lock-lengthening on the Erie and Oswego canals. This time really marks the beginning of renewed interest in canal improvement, showing the swing of the pendulum away from the intensely adverse public sentiment of a decade earlier. This renewed interest, prompted by the pressing need of meeting sharp competition, at first was content with the project of lock-lengthening, but eventually it did not rest satisfied until the present movement to modernize the canal system was undertaken.

1892–1895. The period of constitutional and legislative action and of popular approval, preparatory to the second enlargement of the Erie and Oswego canals and another attempt at increasing the size of the Champlain. During this period, electricity first made its appearance as a motor for towage.

1896–1898. The period of the second enlargement of the chief canals, interrupted in its midst by the exhaustion of funds, and followed by an investigation of alleged frauds and extravagances. The period closes with the appointment of a committee to formulate a suitable canal policy.

1899–1903. A period of preliminary surveys, considerations and agitation for the Barge canal.

1904–the present. The beginning of the period of reconstructing the State canal system, according to plans and dimensions of modern practice.

CHAPTER 1.

FIRST ATTEMPTS AT IMPROVEMENT.

From the time of the first settlements to the completion of operations by the Inland Lock Navigation Companies.

Henry Hudson sailed up the river that bears his name in 1609, and within a few years the first Dutch settlements on this river were planted. In the year preceding Hudson's voyage, Samuel de Champlain had founded Quebec, and in 1615, while accompanying a hostile expedition of his allies, the Algonquins, he penetrated to the seat of the Iroquois power, and thus had the opportunity of discovering the Great Lakes, and of exploring the St. Lawrence river. The Iroquois sought an alliance with the Dutch to offset that of the Algonquins with the French, and in 1617 a formal treaty was made with the Amsterdam Company. As settlements were established on the Hudson and the Mohawk, by the Dutch, and on the St. Lawrence and the Great Lakes by the French, the natural watercourses between these two colonies became the routes of intercourse in times of peace, and the war-paths of the colonists and their Indian allies in times of hostility. Along these streams and at the carrying places were established the first forts. Consequently, the topographical features of the lands between these sections were well known while the country was still a vast wilderness.

In New York State there exist more favorable conditions for opening communication with the great inland lakes than elsewhere in the country. The westerly range of the Allegheny mountains disappears as it approaches the Mohawk valley, and the easterly range is cut by the Hudson, which affords a tidal navigation of about one hundred and fifty miles, while no other Atlantic river cuts this range or is navigable within many miles of the mountains. Recent geological investigation has deduced the fact that, during the recession to the northeast of the last glacial overflow, the waters of the lakes found an outlet through the ridge at Little Falls, and, until the further retreat of the ice-front opened the original channel down the St. Lawrence, the valleys of the Mohawk and Hudson formed the course of a

swift, torrential stream. The low ridge at Rome thus became the divide between the St. Lawrence and Mohawk systems, the waters of the east continuing to flow down the Mohawk.

Although the early settlers knew not the causes of these phenomena, they soon saw the advantages of the topography. The first description we have of these natural avenues of communication is found in a report to the Colonial Governor, in 1724, by Cadwallader Colden, the Surveyor-General, afterwards elevated to the office of Lieutenant-Governor.¹ Colden appears to be one of the first to appreciate the value of the natural streams of New York as a means of commerce, in comparison with the French route by the St. Lawrence, and he even extends his view to a line of communication from the Hudson to the Great Lakes, and thence to the Mississippi and the ocean. He attributes the knowledge of the inland country to the energy of the French settlers, saying, "The *French* have been indefatigable in making Discoveries, and carrying on their Commerce with Nations, of whom the *English* know nothing but what they see in the *French* Maps and Books. The Barrenness of the Soil, and the Coldness of the Climate of *Canada*, obliges the greatest number of the Inhabitants to seek their living by travelling among the *Indians*, or by trading with those that do travel."²

He well appreciated the dangers of climate and storm that beset commerce on the St. Lawrence route. "These Difficulties are so considerable," he says, "that the *French* never attempt above one Voyage in a Year to *Europe*, or the *West-Indies*, tho' it be really nearer *Europe* than any of the *English* colonies."³

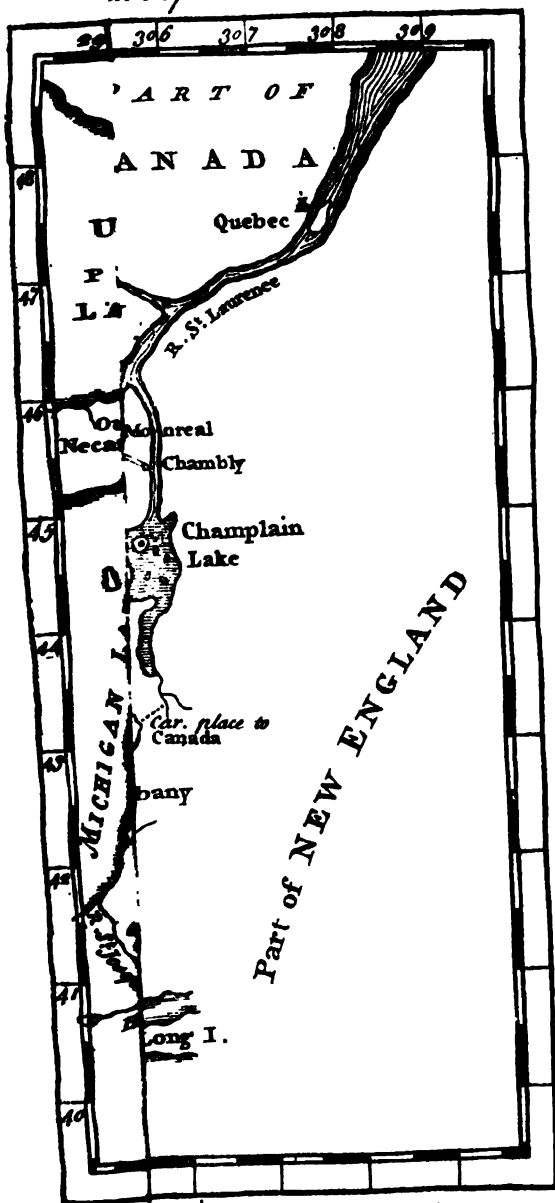
Colden tells of the streams into the western country, and makes the first suggestion of the course of the interior route

¹This report was entitled, *A Memorial concerning the Furr-Trade of the Province of New York, Presented to his Excellency, William Burnet, Esq., Captain General and Governor, &c. by Cadwallader Colden, Surveyor General of the said Province, the 10th of November, 1724*, and is found at length in Colden's *History of the Five Indian Nations*, printed in London in 1747. The map accompanying this history is reproduced in the present volume and shows how extensive and how accurate was the knowledge of the country at that early day.

²*Memorial concerning the Furr-Trade in Papers relating to an Act of the Assembly, etc.*, p. 28, printed in Colden's *History of the Five Indian Nations*. (London, 1747.)

³*Id.* p. 30.

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along which the Erie was finally built. "Goods are daily carried from this Province to the *Sennekas*," say the members of a committee, of whom Colden was one, in reporting to the Governor on November 6, 1724, "as well as to those Nations that lie nearer, by Water all the Way, except three Miles, (or in the dry Season, five Miles) where the Traders carry over Land between the *Mohawks-River* and the *Wood Creek*, which runs into the *Oneida-Lake*, without going near either *St. Lawrence-River* or any of the *Lakes* upon which the *French* pass." "Again Colden says in his *Memorial concerning the Furr-Trade*: "But besides this Passage by the *Lakes*, there is a River which comes from the Country of the *Sennekas*, and falls into the *Onondaga* [Oneida and Oswego] *River*, by which we have an easy Carriage into that Country, without going near the *Cataracui* [Ontario] *Lake*. The Head of this River goes near to *Lake Erie*, and probably may give a very near Passage into that Lake, much more advantageous than the Way the *French* are obliged to take by the great Fall of *Jaraga* [Niagara]. . . . But as this Passage depends upon a further Discovery, I shall say nothing more of it at this time."⁵

In his "Memoir" prepared in honor of the celebration attending the completion of the New York canals in 1825, Cadwallader D. Colden reviews this report of his grandfather in the following interesting passages, which reveal the routes of intercourse at the time:

"In seventeen hundred and twenty-four, the then surveyor general of the Province of New York, made a report to the Colonial Governor, in which he describes the water courses and carrying places between Albany and Montreal, by way of Lake Champlain, and between Albany and the Cataraqui Lake, which is now called Ontario, by the Mohawk River, and the river which runs into the Oneida Lake, with as much accuracy as they could be described at this moment. The carrying place between the Mohawk, and the stream which we now call Wood Creek, he describes as a 'portage only three miles long, except,' says he, 'in very dry weather when the goods must be carried two miles further.' He then describes the passage down the Onondaga River, to the Cataraqui Lake, and shows that goods might be

⁵*Memorial concerning the Furr-Trade, etc.*, p. 14.

⁶*Id.* p. 34.

carried from Albany to that Lake by the Mohawk, the Oneida, and the Onondaga River, cheaper, and much more conveniently, than as they were then transported, to the mouth of the Oswego River by way of the Hudson, Lake Champlain, Montreal, and the River Saint Lawrence.”^a

“The historian of the Five Indian Nations informs us, that Governor Burnet erected a Fort and trading houses at the mouth of the Onondaga River, on account, says he, ‘of its water communications with the country of the Iroquois, and for the facility of transportation between the Lakes and Schenectady, there being but three portages in the whole route, and two of them very short.’ These, no doubt, were the carrying places, at the Little Falls, the Wood Creek, and at the Oswego Rapids.”^b

Of this same report of the Surveyor-General in 1724, the committee of the corporation of the City of New York, having charge of the celebration at the opening of the Erie canal, says:

“In this Report the author not only describes the water-courses and portages between this and Canada, and those between us and the great western Lakes, with wonderful accuracy, but presents, in the clearest manner, the immense facilities which these water communications are susceptible of affording to our internal trade. He also carries his views beyond the Lakes to the Mississippi, and after stating that ‘many of the branches of that river come so near to the branches of the rivers which empty themselves into the Great Lakes, that in several places there is but a short land carriage from the one to the other;’ he concludes with the following emphatic observation:—‘If one considers the length of this river (the Mississippi) and its numerous branches, he must say, *that by means of this river and Lakes, there is opened to his view such a scene of inland navigation as can not be paralleled in any other part of the world.*’”^c

“The French government of Canada very early attempted to prevent our participation in the Indian trade, by their establishments on Lake Ontario, at Fort Frontinac in the year 1672, and at Fort Niagara in the year 1725, and on Lake Champlain by their Fort *St. Frederick*, built near Crown Point, in the year 1731.”^d

^a*Memoir, etc., at the Celebration of the Completion of the New York Canals*, by Cadwallader D. Colden, p. 11. (New York, 1825.)

^b*Id.* p. 12.

^c*Id.* p. 99.

^d*Facts and Observations in Relation to the Origin and Completion of the Erie Canal*, p. 3. (New York, 1825.)

Thus these natural watercourses became the first public highways, and roads, when they were opened later, were so poor and the carrying of goods over them so expensive, that the people naturally retained the streams as channels for the transportation of goods and often as a means of travel, making some improvements from time to time, as we learn from some of the early writers.

Carver, who traversed this territory in seventeen hundred and sixty-eight, says, "The Oniada Lake, situated near the head of the River Oswego, receives the waters of Wood-Creek, which takes its rise not far from the Mohawks River. These two lie so adjacent to each other that a junction is effected by sluices at Fort Stanwix."¹⁰

"Here [Little Falls] the roaring rapids interrupted all navigation, empty boats not even being able to pass over them. The early portage of one mile here in sleds over the swampy ground has been described as it was in 1756, when enterprising Teutons residing here transferred all boats in sleds over marshy ground which would 'admit of no wheel carriage' . . . later on, about 1790, we find that the Germans' sleds were out of use and that boats were transferred on wheeled vehicles appropriately fashioned to carry them without damage to their hulls. No great boats could be transferred by such means; this fact had a tendency to limit the carrying capacity of Mohawk batteaus to about one and a half tons."¹¹

Christopher Colles, who was authorized by the Legislature, in 1785, to make the first survey of the Mohawk, says that "before the war 600 batteaux passed annually between the Wood Creek and the Mohawk River."¹²

The war of 1756, and especially the two expeditions under Colonel Bradstreet and General Prideaux, which used the route of the Mohawk, Wood creek and Oneida lake for transporting troops and military stores, demonstrated the necessity of improved

¹⁰*Travels through the Interior Parts of North-America, in the Years 1766, 1767 and 1768.* By J. Carver, p. 172. (London, 1778.)

¹¹Archer Butler Hulbert's *Historic Highways of America*. Vol. 14, pp. 18-19.

¹²*Proposals for the Speedy Settlement of the Waste and Unappropriated Lands on the Western Frontiers of the State of New York, and for the Improvement of the Inland Navigation between Albany and Oswego*, p. 7. (New York, 1785.)

inland navigation. Governor George Clinton was a subaltern officer in this war, having been engaged in the operations against Fort Frontenac (Kingston) and Niagara, and doubtless the knowledge he gained of the natural waterways at that time induced him in 1791 to recommend to the consideration of the Legislature the subject of their improvement. After the treaty of Paris in 1763, till the Revolutionary war in 1775, the channel of communication to Oswego was in constant use by the fur traders. From the first the populous and powerful Indian confederacy of the Six Nations, distributed along the shores of the Genesee river, the Canandaigua, Seneca, Cayuga and other small lakes in the central and western part of the colony, had been the ally of the English against the hostile French, and the easy passage to their country through the Seneca river had long been used by those who carried on a valuable trade with these tribes.

During the latter half of the eighteenth century England had vigorously engaged in the building of canals. The invention of canal-locks had given a great impetus to the construction of canals in continental European countries, but the English people had been slow to follow their example, delaying nearly a century after the famous Languedoc canal, designed by Riquet, had been built between the Bay of Biscay and the Mediterranean. The master minds of the new colonies were quick to perceive the vast field for inland navigation in America, and almost at its beginning, the young Republic followed the lead of the mother country in these public improvements.

In the colonial period, the restrictive measures imposed by England were not conducive to public improvements, and no effectual steps were taken. However, the first official mention of improving inland navigation occurred during that period, as appears in the following message from Governor Moore to the General Assembly, on December 16, 1768:—

“A message from his Excellency the Governor, by Mr. Banyar, Deputy Secretary, which being read, is in the words following, viz.

“Gentlemen,

“While the attention of the house of Assembly is employed in forming new regulations for the Indian trade, it may not be thought improper to lay before them any proposal which can

give assistance to the operation of their plans, and by removing the difficulties which particularly affect that branch of commerce, enlarge the advantages proposed to the province.

“It has been observed, by all who are concerned in the Indian trade, that the great inconvenience and delay, together with the expense attending the transport of goods, at the carrying places, have considerably diminished the profits of the trader, and called for the aid of the legislature, which, if not timely exerted in their behalf, the commerce with the interior part of the country may be diverted into such channels, as to deprive this colony of every advantage which could arise from it. The obstruction of the navigation of the Mohawk river, between Schenectady and Fort Stanwix, occasioned by the falls of Canajoharie, has been constantly complained of, though it is obvious to all who have been conversant in matters of this kind, that the difficulty is easily to be removed, by sluices, upon the plan of those on the great canal of Languedoc, in France, which was made to open a communication between the Atlantic ocean and the Mediterranean. The opportunity I had in my tour, last summer, of examining this carrying place, and of measuring the falls, has engaged me to recommend to the house of Assembly, the improvement of our inland navigation, as a matter of the greatest consequence to the province, and worthy of their serious consideration.”

H. Moore.

“Ordered.

“That the said message be referred to the consideration of the committee to whom his Excellency’s message of the 6th instant is committed.

“The house, according to order, resolved itself into a committee of the whole house, to consider of, and draw up proper and constitutional resolves, asserting the rights of his Majesty’s subjects within this colony, which they conceive have been greatly abridged and infringed by several acts passed by the last parliament of Great Britain.”¹³

After long discussions these resolves passed the House on December 31, and on the second of the following month the Gov-

¹³*Journal of the Votes and Proceedings of the General Assembly of the Colony of New York*, October 27, 1768,—January 2, 1769, p. 51. (New York, 1769, reprinted, Albany, 1820.)

ernor exercised his prerogative by dissolving the Assembly, thus leaving the proposition for inland navigation not acted upon. Here the project rested till after the close of the Revolutionary war.

To George Washington is due the honor of being the projector of canals in the United States. In the fourth edition of Phillip's *General History of Inland Navigation*, published in London in 1803, we read:

"The immortal Washington was the original father and promoter of these canals and improvements, and well did he deserve that admirable motto,—'Twice the savior of his country. After conducting her to liberty, he opened her the way to prosperity by new roads and canals, and varying the produce of agriculture.'"¹⁴

Early in his life General Washington had given his attention to measures for facilitating the means of intercourse between the eastern and western territories. Before the Revolutionary war he had succeeded so far as to obtain official sanction for one of his projected plans—a bill empowering individuals to open a part of the Potomac for navigation—and the enterprise was in a fair way to successful execution, when the war directed the energies of the whole country to the struggle for independence.

Before peace was declared, Washington started from Newburgh on a journey through northern and central New York. In a letter to the Marquis de Chastellux he wrote thus in 1783: "I have lately made a tour, . . . through the Lakes George and Champlain as far as Crown Point;—then returning to Schenectady, I proceeded up the Mohawk river to fort Schuyler, crossed over to Wood creek which empties into the Oneida lake, and affords the water communication with Ontario. I then traversed the country to the head of the eastern branch of the Susquehanna, and viewed the lake Otsego, and the portage between that lake and the Mohawk river at Conajohario. Prompted by these actual observations, I could not help taking a more contemplative and extensive view of the vast inland navigation of these United States, and could not but be struck with the immense diffusion and importance of it; and with the goodness of that Providence which has dealt his favours to us with so profuse a hand. Would to God we may have wisdom enough to improve them. I shall not

¹⁴P. 581.

rest contented until I have explored the western country, and traversed those lines (or great part of them) which have given bounds to a new empire."¹⁵

In 1784 we find the first official mention of improvements after the Revolutionary war. A petition from Christopher Colles appears in the *Assembly Journal* of November 3, 1784, and in the *Senate Journal* of November 8, 1784, proposing a plan of inland navigation on the Mohawk river. On the 6th of November, Mr. Adgate, from the Assembly committee to whom was referred the memorial of Christopher Colles, reported: "That it is the opinion of the Committee, that the laudable proposals of Mr. Colles, for removing the obstructions in the Mohawk river, so that boats of burthen may pass the same, merit encouragement; but that it would be inexpedient for the legislature to cause that business to be undertaken at the public expense.

"That as the performing such a work will be very expensive, it is therefore the opinion of the Committee, that if Mr. Colles, with a number of adventurers (as by him proposed) should undertake it, they ought to be encouraged by a law, giving and securing unto them, their heirs and assigns forever, the profits that may arise by the transportation, under such restrictions and regulations as shall appear to the Legislature necessary for that purpose; and authorizing them to execute that work through any lands or improvements, on payment of the damages to the proprietors, as the same shall be assessed by a jury," and it was

"Resolved, That the House do concur with the Committee in the said report."¹⁶

Colles was an Irish engineer, who emigrated to America in 1765. Previous to the Revolutionary war he had delivered a series of lectures on inland lock navigation, and had proposed to build a reservoir for New York City. He was a man possessing large knowledge and ingenuity, but his scheme was considered visionary and he was always in pecuniary straits.

The subsequent endeavors of Colles are well described in the following selections from *The Canal Policy*: "At the next meeting of the legislature, Mr. Colles again presented a memorial,

¹⁵*The Life of George Washington*, by John Marshal, Vol. II., p. 65. (Philadelphia, 1832.)

¹⁶*Assembly Journal*, 1784, p. 41.

and on the 5th of April, 1785, a favorable report was made by the committee to whom it was referred: and \$125 was appropriated in the supply bill 'for the purpose of enabling him to make an essay towards removing certain obstructions in the Mohawk river, and to exhibit a plan thereof to the legislature at their next meeting.'

"In pursuance of this arrangement, Mr. Colles visited the country to be affected by the intended improvements, and took an actual survey of the principal obstructions upon the Mohawk river as far as Wood creek. The results of this journey of observation and survey, were published by him in a pamphlet, entitled '*Proposals for the speedy settlement of the waste and unappropriated lands on the western frontier of the state of New-York, and for the improvement of the inland navigation between Albany and Oswego. Printed at New-York, by Samuel Loudon, 1785.*'

"In this pamphlet he proposed the establishment of a company with a capital of £13,000 to prosecute the works, and to be allowed toll—and also to receive a grant of 250,000 acres of western lands, on condition of completing the inland navigation of the Cahoes, the Little Falls, and Fort Schuyler, within five years.

"He estimated the expense of a canal of four and half miles, twenty locks &c. at [the Cahoes].....	£6,000.
At the Little Falls, one mile of canal, six locks &c. .	3,000.
At Fort Schuyler, (now Rome) 1 mile and a fourth, two locks, &c.....	2,000.
Improving some of the rifts.....	2,000.
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"And he stated, as the least revenue to the company that could accrue, an annual income of £936, arising from the passage of only 120 tons of goods weekly, at six shillings per cwt. for twenty-six weeks.

"At the next session Mr. Colles renewed his application, and on the 8th of March, 1786, a committee reported favourably on a memorial of Christopher Colles and his associates, and leave was given to bring in a bill to compensate them for the purposes specified in that memorial.

"It does not appear that any further steps were taken on the part of Mr. Colles. His operations probably failed for the want of subscribers to the contemplated association. It is not a little remarkable that this project commenced so soon after the termination of the Revolutionary war, and that contemporaneous efforts were made in some of the southern states."¹⁷

The *Assembly Journal* of 1786 shows that on the first of February, "A petition from Christopher Colles, with a report of the practicability of rendering the Mohawk River navigable, was read and referred to Mr. Jeffrey Smith," and others. The following is an extract from the *Journal* of March 17, 1786:

"Mr. Jeffrey Smith moved for leave to bring in a bill, entitled, *"An act for improving the navigation of the Mohawk river, Wood creek and the Onondaga river with a view of opening an inland navigation to Oswego, and for extending the same, if practicable, to Lake Erie.*

"Ordered, That leave be given accordingly.

"Mr. Jeffrey Smith accordingly brought in the said bill, which was read the first time, and ordered a second reading."

The language of this bill is significant as it is the first time that Lake Erie is mentioned in connection with inland navigation, and not again does it appear in legislative action (except the bills of 1797 and 1798 for incorporating the Niagara Canal Company to construct a canal around the falls from Lake Erie to Lake Ontario) till the resolution of 1808 ordered the survey of the route which later became the Erie canal.

Although this bill, introduced by Mr. Jeffrey Smith, was reported by the committee of the whole, on the twenty-fifth and twenty-ninth of March, and the fourth and fifth of April, the session closed without any final action being taken.

We find no further record of official action till the year 1791, but meantime other states were adopting measures to improve their inland navigation. At this time it is appropriate to mention a man, who, on account of knowledge gained through his travels during these years, was able to influence subsequent legislation,—Mr. Elkanah Watson, a native of Massachusetts, but residing in Albany for many years after 1789. Having traveled

¹⁷*The Canal Policy of the State of New York*, by Tacitus (generally conceded to have been De Witt Clinton), p. 12. (Albany, 1821.)

extensively in both the United States and Europe, he had become conversant with many enterprises for improving navigation. He became a director of the Inland Lock Navigation Company when that company was incorporated in 1792.

While not the first to propose the improvement of the natural waterways of the state, he is still entitled to lasting praise for his earnest endeavors toward bringing this scheme to fruition. In 1820 he published in Albany a book entitled, *History of the Rise, Progress, and existing Condition of the Western Canals of the State of New-York, from September 1788, to the completion of the Middle Section of the Grand Canal, in 1819*. Unhappily the chief object of writing this book was to support the claim of his friends, in a controversy which arose as the Erie canal was nearing a successful completion, that he should have the exclusive honor of being considered the projector of the canal policy of the State. A few excerpts from this book will give a good idea of the conditions that prevailed in New York, and of the progress of canal projects in other states. He says:

"In the winter of 1785, I spent two days with the immortal Washington, at Mount Vernon. His mind being intently settled on the project of connecting the western waters, by canals, with his favourite Potomack, and of improving the navigation of the Monongahela, and other branches of the Ohio; principally with a view of diverting the fur trade from Detroit to Alexandria, instead of going to Montreal, as heretofore.¹⁸ His conversation was principally turned to the interior country, and opening the navigation of the Potowmac, by locks and canals,—at the Seneca, great and little falls. His mind appeared absorbed, and devoted, to this great object, now in earnest contemplation."¹⁹

He quotes as follows from notes made at the time of his visit:—
"Both Virginia and Maryland have reciprocally incorporated a canal company, of which Washington has accepted the presidency. Preparations are now in full train to commence operations the ensuing spring; not only to open a free navigation of the Potowmac, but eventually to remove obstructions in such branches of the Ohio as point towards Lake Erie; so as not only to give a direction to the fur trade from Detroit to Alexandria,

¹⁸Watson's *History . . . of the Western Canals*, p. 8.

¹⁹*Id.* p. 87.

but also the produce of those vast intervening countries which lie as yet in a state of nature. To demonstrate the practicability of this, and the policy of preserving a commercial intercourse with those extended regions, especially should the Mississippi be opened, was his constant and favourite theme.

"To establish, also, the probability that the fur trade from Detroit will take this direction, he produced to me the following estimate, which I copied from his MS. in his presence, and with his aid.

"From Detroit, at the head of Lake Erie, via Fort Pitt, (now Pittsburgh) and Fort Cumberland, at the head of the Potowmac, is	607 miles.
'To Richmond,	840
'To Philadelphia	741
'To Albany	943
'To Montreal,	955.'

"Thus it appears that Alexandria is 348 miles nearer Detroit than Montreal, with only two carrying places, of about forty miles." 20 *

The three years following his visit to General Washington, Mr. Watson spent in traveling about the southern States, visiting the sites of various projected canals. In 1788 he returned north, and in September of that year was traveling in the valley of the Mohawk, being present at the Indian treaty at Fort Stanwix (Rome). Speaking of this journey he says: "It was on this occasion I first conceived the idea of the practicability of counteracting, at least by a fair competition the favourite

*Watson's *History . . . of the Western Canals*, p. 88.

*NOTE.—In 1784 Washington had made an exploration through western territory. A summary of his *Journal* of this trip is quoted in Vol. 13 of Hulbert's *Historic Highways of America*, pp. 35-50, which gives in detail the notes of which Mr. Watson made a brief summary. This *Journal* has recently been made public for the first time in a publication by Mr. Hulbert, under the title of *Washington and the West*. The Potomac Company, to which Mr. Watson refers, began operations in 1785, and struggled with many difficulties for three years without accomplishing the opening of navigation. Then Washington was called to the Presidency of the United States, and the affairs of the company dragged along with no results till after the Erie canal was completed in 1825. Then the objects sought by the Potomac Company were undertaken by the Chesapeake and Ohio Canal Company.

plan Washington was then pursuing, with zeal and ardour, to allure all the trade of the western regions, connected with the Ohio and the great lakes,—even the fur trade from Detroit, to Alexandria.”²¹ “Doubtless many others may have conceived the same project many years prior, and probably subsequent, to my first visit at Fort Stanwix, in 1788. . . . But I have not yet been able to trace anything like a settled plan or system, to combine these waters prior to 1788.”²²

The condition of the country at this time may be imagined from the following extract from Mr. Watson’s *Journal*, describing his journey on horseback in 1788, while in the vicinity of Fort Schuyler (Utica): “From Col. Starling’s, I began to traverse the deserts, bordering on the Indian country. The road is almost impassable, as I was upwards of three hours reaching the Mohawk, opposite old Fort Schuyler, only six miles. Here I reluctantly forded the river, being alone, without a guide, and both shores alive with savages.”²³

In his speech to the Legislature on January 5, 1791, Governor George Clinton said:

“Our frontier settlements, freed from apprehensions of danger, are rapidly encreasing and must soon yield extensive resources for profitable commerce; this consideration forcibly recommends the policy of continuing to facilitate the means of communication with them, as well to strengthen the bands of society, as to prevent the produce of those fertile districts from being diverted to other markets.”²⁴

On February 15, 1791, Mr. Williams proposed in the Senate a concurrent resolution to appoint a joint committee “to examine what new roads are necessary to be opened in this state, and what obstructions in the Hudson and Mohawk rivers will be proper to be removed, and to report thereon with their opinion of the most eligible mode for effecting the same, and defraying the expense thereof.” This resolution being carried, nine to eight, and being agreed to by the Assembly, the committee was appointed and on the twenty-sixth of the same month, the report

²¹Watson’s *History* . . . of the Western Canals, p. 11.

²²*Id.* p. 7.

²³*Id.* p. 12.

²⁴*Assembly Journal*, 1791, p. 4.

was made to the Assembly by James Livingston of Montgomery county, as appears from the following excerpt from the *Journal* of that body:

"Mr. Livingston, from the committee of this House, consisting of a member from each county in the state, appointed of a joint committee with a committee of the honorable the Senate, to examine and report relative to roads and inland navigation, reported, that it is the opinion of the committee, that the commissioners of the land office be authorized to make and offer proposals to such persons or association of persons as will contract to open a water communication between the Mohawk river and Wood-Creek; and such person or persons as will remove impediments to the navigation of boats between Rensselaerwyck and Fort Edward; and such person or persons as will open a water communication between Fort Edward and Lake Champlain; with power to grant such person or persons an exclusive right to the profits of a reasonable toll on the canals when so opened, for a limited term of years—And further, that it is the opinion of the committee, that the rivers Delaware and Susquehannah, with their navigable branches ought, to be made public highways; and that provision by law ought to be made for removing and preventing any obstructions that now are, or hereafter shall be made in the free navigation thereof. And that the committee are further of opinion, that the commissioners of the land office be requested to report to this House what new roads are proper to be laid out at this time, and whether any and what legislative provision is necessary for that purpose.

"*Ordered*, That the report be committed to a committee of the whole House."²⁵

As a result of this favorable report, the first canal law in New York State was passed March 24, 1791, entitled "An act concerning roads and inland navigation." This act contained the following clause: "*And be it further enacted . . .* That the commissioners of the land office be and they hereby are authorized to cause to be explored, and the necessary survey made, of the ground situated between the Mohawk river, at or near Fort Stanwix, and the Wood creek, in the county of Her-

²⁵*Assembly Journal*, 1791, p. 84.

kimer; and also between the Hudson river and the Wood creek in the county of Washington; and to cause an estimate to be made of the probable expence that will attend the making canals, sufficient for loaded boats to pass; and report the same to the legislature at their next meeting." £100 was appropriated for the expenses of this exploration.

During the recess of the Legislature, these surveys and estimates were made. In September, 1791, Major Abraham Hardenburgh, assisted by Benjamin Wright, who was later very intimately connected with the building of the canals of the State, made the necessary surveys between the Mohawk river and Wood creek. The line as laid out was very nearly that on which the canal was afterwards built. The whole expense of the surveys was only three-fifths of the amount appropriated.²⁶

Before considering the report of these investigations, it will be interesting to notice another journey taken by Elkanah Watson, which had considerable bearing on the subsequent action of the Legislature.

For the purpose of obtaining information for business operations as well as to learn the possibilities of opening the streams for navigation, Mr. Watson made a journey from Albany to Seneca lake, chiefly by water, in September, 1791, in company with Gen. Van Cortland, Stephen N. Bayard and Jeremiah Van Rensselaer. His *Journal* of this journey contains many references to the canals, which he saw in imagination. In speaking of the manufacture of salt near Salt (now Onondaga) lake, he makes these significant entries:

"These works are in a rude, unfinished state,—but are capable of making about eight thousand bushels of salt per annum; which is nearly the quantity required for the present consumption of the country. . . .

"Providence has happily placed this great source of comfort, and wealth, precisely in a position accessible by water in every direction.

"When the mighty canals shall be formed and locks erected, it will add vastly to the facility of an extended diffusion, and the increase of its intrinsic worth.

²⁶At that time £100 was equivalent to \$250. The exact amount expended for the survey was \$149.73.

"It will enter Ontario, and the other great lakes, and find its way down the St. Lawrence, by Oswego;—into Pennsylvania, and the Chesapeake, up Seneca river, to the head of the Seneca lake, and by a portage, (perhaps eventually a canal,) of eighteen miles, to Newtown, on the Susquehanna river:—And through the canals in contemplation, up Wood creek, and down the Mohawk river into the Hudson."²⁷

Of the difficulties encountered on these natural watercourses, he says: "At that period [1791] they could only transport from one and a half, to two tons, in a flat boat, at an expense of from seventy-five to one hundred dollars a ton, from Schenectady to this place [Seneca Falls]."²⁸

After his return, Mr. Watson put into the hands of General Philip Schuyler, a prominent member of the Senate, on January 1, 1792, a report formed from the remarks and estimates contained in his *Journal*, in which he traced the route of the proposed canals, described the obstacles to be removed, devised the mode of removal, calculated the probable expense of some of the operations, and concluded with the declaration, that "it would require a folio volume to point out the advantages that would result to the union, to the state, and to individuals, from laying the navigation completely open."²⁹ About the same time he gave his *Journal* to General Schuyler for perusal. After reading these, General Schuyler declared his intention of doing his utmost to obtain a canal law that winter.

On January 3, 1792, the commissioners of the land office submitted their report of surveys made in pursuance of the act of March 24, 1791. A part of the report reads thus: "The commissioners are happy to find that these objects are not only practicable, but attainable at a very moderate expense, when put in competition with their advantages and importance to the state."

Two days later Governor George Clinton, in a speech conveying this report to the Legislature, says: "I now submit to you

²⁷Watson's *History . . . of the Western Canals*, p. 42.

²⁸*Id.* p. 98.

²⁹*Vindication of the claim of Elkanah Watson, Esq., to the Merit of Projecting the Lake Canal Policy, etc.*, by Robert Troup, p. 14. (Geneva, N. Y., 1821.)

their report, which ascertains the practicability of effecting this object at a very moderate expence; and I trust, that a measure so interesting to the community, will continue to command the attention due to its importance, and especially as the resources of the state will prove adequate to these and other useful improvements, without the aid of taxes."³⁰

This report was referred to a joint committee of both houses, and on February 7, General Williams of the Senate brought in a bill entitled "An act for constructing and opening a canal and lock navigation in the northern and western part of this state." This bill met with opposition from friends of the project, on the ground that its scope was too limited. General Schuyler then came to the front as the chief advocate, and later, during the years of construction, he acted as president of the companies undertaking the work, and also as superintending engineer during the early stages. From the correspondence of General Schuyler at this time, we discover some of the causes which influenced legislative action. The following is an extract from a letter to General Schuyler written by Elkanah Watson in February, 1792: "I have been attentive to the progress of the great object of the Western Canals since the commencement of the session of the Legislature. I observe, with great regret, that no one of that body (not even the Governor) appears to soar beyond Fort Stanwix except yourself. To stop at that point will be half doing the business. . . . The charter should stretch to the Seneca Lake, and to the harbor of Oswego, as suggested in my journals . . . so as to admit the commerce of the great lakes into Hudson river."³¹

In replying to this letter on March 4, General Schuyler wrote: "A joint committee of both houses (of which committee I was not one) had been formed: this reported a bill for incorporating two companies, one for the western, and another for the northern navigation. The former was to have been carried *no farther than the Oneida lake*. The bill contemplated a commencement of the works from the navigable waters of the Hudson, and to be thence continued to the point I have mentioned, and it obliged the corporation, in a given number of years, (which was intended

³⁰ *Assembly Journal*, 1792, p. 6.

³¹ *Vindication of the Claim of Elkanah Watson, etc.*, appendix, p. 16.

to be ten) to the completion of the whole western navigation. When this bill was introduced into the senate, the plan generally appeared to me so exceptionable, that I thought it incumbent on me to state my ideas on the subject at large. They were approved of unanimously by the committee of the whole house, and I was requested to draught a new bill. This was done, and it has met with the approbation of the committee of the whole, and will be completed tomorrow by filling up the blanks. . . . A clause was proposed for preventing any canals to the Susquehannah, but it was lost: it being conceived improper to oblige the inhabitants of the western country to make Hudson's river, or the commercial towns on it, the only markets."³²

The Legislature had met in New York, early in January, and so zealous was Mr. Watson for the success of the project, that he had gone there to aid General Schuyler, staying several weeks, and proposing to go again if needed. While in New York he had addressed an article to the Legislature over the signature of "A. Citizen," and after returning to Albany another over the signature of "An Inland Navigator." These were published in *The New York Journal and Patriotic Register*, and in them he set forth the natural advantages possessed by New York State for opening navigation to the western country, and the efforts being made by other States for obtaining the western trade, and advocated the larger policy of extending the rights of the company to the Great Lakes. He says in one of the articles: "Hence it appears that every natural advantage is in favor of New-York: provided only attention is paid to promote the improvement necessary; and it merits a serious consideration, that nature has favored this quarter, yet, through inattention, the channel of commerce may receive an early bias to a different point: and commerce is of such a nature, that when once established in any particular direction, it is generally found difficult to divert it."³³

Through the influence of General Schuyler the bill as drawn by him passed both Houses on March 24, and the council of revision on March 30, 1792. This law, entitled "An act for establishing

³²*Vindication of the Claim of Elkanah Watson, etc.*, appendix, pp. 33-35.

³³*Id.* p. 32.

and opening lock navigations within this State," incorporated two companies,—the Western and the Northern Inland Lock Navigation Companies, and declared the purpose of the Western Company as that "of opening a lock navigation from the now navigable part of Hudson's river to be extended to Lake Ontario, and to the Seneca lake," and the other company "for the like purpose, from the now navigable part of Hudson's river to Lake Champlain." The canals were to be of a size for the passage of boats forty feet long, twenty feet wide, and drawing, when loaded, two feet of water. The act provided for the opening of books for taking subscriptions, no person to be allowed to subscribe for more than ten shares, and the sum of twenty-five dollars per share to be paid at the time of subscribing. The number of shares was limited to one thousand, but as the work progressed, more money could be raised by assessing the old subscribers, or obtaining new ones. The act further provided for the gift by the State, of twelve thousand five hundred dollars to each company, after it had expended twenty-five thousand dollars, and it limited the rate of toll to twenty-five dollars per ton from the Hudson to Seneca lake or Lake Ontario, and to twenty dollars per ton from the Hudson to Lake Champlain.

So great did the task appear that the companies were granted fifteen years in which to accomplish the work. As the necessity arose, laws were passed by succeeding Legislatures, amending this act of incorporation, and giving the companies more privileges, and even State aid.

According to the act of incorporation, the books for subscriptions were to be opened at New York and Albany on the first Tuesday of May, 1792, and to remain open till the last Tuesday of the same month. Mr. Watson tells us that he had the good fortune to be in New York when the books were opened. In describing the event, he says: "They had been opened three days by the commissioners, at the old coffee-house, and not a share was subscribed. I considered the cause hopeless,—called on my friend (I think it was) James Watson, Esq., and induced him, with much persuasion, to subscribe twenty shares; from that moment the subscriptions went on briskly.

"On my arrival in Albany, the commissioners in that city had kept the books open several days, at Lewis's old tavern, in State-street, and no mortal had yet signed to exceed *two shares*.

I immediately subscribed seven in each company, and wrote to Gen. Schuyler, then in New-York, soliciting him to authorize me to extend his subscriptions as an example to others.

"From the moment I subscribed ten shares for Gen. Schuyler, by his directions, the subscriptions in Albany also progressed rapidly."³⁴

In the summer and fall of 1792, surveys were made along both the western and northern routes. A report of the survey along the Mohawk river is contained in the following quotation from Mr. Watson's history:

"The following is a *summary* of an official report, made to the directors of the Western Inland Lock Navigation Company.

"The committee appointed on the 14th August, 1792, &c. beg leave to report, &c.

"That they proceeded, on the 20th August last, from Schenectady, by water, accompanied by surveyors and artificers, to Fort Stanwix, 121 3-4 miles, as the river runs.

"That they measured the depth of the Mohawk, in its whole extent from Schenectady.

"That they noticed all the obstructions on the route, estimating the probable cost of a canal and locks, at the Little Falls, three-fourths of a mile in length, and thirty-nine feet fall;—that the whole, with five locks, will cost about £10,500.

"That a canal at Fort Stanwix, and improvements in Wood creek, will cost about £3,000.

"That means be adopted to extend the navigation into Ontario, from the Hudson's river. That the aggregate estimated expense to complete the navigation, from Schenectady to Wood creek, is £39,500, &c. All which is respectfully submitted. Albany, 1st September, 1792.

Philip Schuyler,	} Committee.' " ³⁵
Goldsbrow Banyer	
Elkanah Watson	

The surveys were considered with favor by the directors of the companies, and it was determined to begin operations at Little Falls. However, before work was begun, the Legislature was

³⁴Watson's *History . . . of the Western Canals*, pp. 85-86. (The apparent discrepancy of subscribing twenty shares is probably explainable by the supposition that there were ten for each company.)

³⁵*Id.* p. 92.

appealed to for a modification of the law, which incorporated the company. On December 22, 1792, an act was passed which specified that the width of locks could be determined by the officers of the companies, but the locks must not be less than ten feet wide by seventy feet long; also that the previous act requiring two feet depth should not be strictly enforced if this depth was maintained for the greater part of the time from March to December; and that the companies could use surplus waters for various manufacturing and irrigating purposes. The granting of this privilege inaugurated a policy which proved very disastrous to the interests of the State in after years. While the waterways were under the control of corporations there was not much abuse of this privilege, but later when the State had completed the Erie canal, and had made similar concessions, so much water was taken that navigation was seriously impeded and large sums of money were expended to supply sufficient water for both canal and manufacturing purposes. This subject will be more fully discussed, at the proper time.

During the following spring, work was begun at Little Falls. To quote the language of the directors: "The work was accordingly commenced in April 1793, with nearly three hundred labourers, besides a competent number of artificers, but its progress was arrested early in September, for want of funds, many of the stockholders having neglected to pay the requisition made by the Directors, either because they had not the means to supply such advances, or from an apprehension of the impracticability of succeeding in the operation.—January, 1794, the work was, however, recommenced, although feebly, and some progress made, in hopes that the Legislature would afford aid, by grants, or loans of money, or by taking the unsubscribed shares. Accordingly, the Legislature . . . directed a subscription, on the part of the people of the State, of two hundred shares to each company; this measure was attended with the most salutary effects. The hopes and confidence of the companies were revived, and the work recommenced in May last, with a correspondent degree of alacrity; . . . it was the 17th of November before the Canal and Locks were so far completed, as to afford a passage to boats."³⁰

³⁰*Report of the Directors of the Western and Northern Inland Lock Navigation Companies, in the State of New York to the Legislature, pp. 3-4. (New York, 1796.)*

Describing the canal, they say: " . . . its length is 4752 feet, . . . the aggregate fall is 44 feet 7 inches. Five locks having each nearly 9 feet lift are placed towards the lower end of the Canal, and the pits, in which they are placed, have been excavated out of solid rock, of the hardest kind; the chamber of each lock is an area of 74 feet by 12 feet in the cleave, and boats drawing three feet and an half of water may enter at all times; the depth of water in all the extent of the Canal beyond the locks is various, but not less than 3 feet in any place; near the upper end of the Canal a guard lock is placed without lift, to prevent a redundancy of water; . . . about 2550 feet of the Canal is cut through solid rock."²⁷

In the summer of 1793, Wood creek, the stream which flows into Oneida lake, was cleared of fallen timber and straightened to the extent of shortening its length more than seven miles.

In 1793, the Northern Company began a canal near Stillwater intending to extend it to Waterford, but work was stopped for lack of funds. A contract was also made for constructing a canal to open the navigation of the northern Wood creek with Lake Champlain, and in 1794 this creek was partially cleared of fallen timber.

Previous to 1795, the directors had proceeded without the services of an engineer, but in May of that year they employed Mr. William Weston, an able English engineer, to superintend the work at Little Falls, and to examine the whole line of proposed improvements. His report and estimates accompanied the report of the directors to the Legislature. He estimated the cost of providing navigation from the western extremity of Cayuga lake to the Hudson river at Troy, for "boats of twenty tons, and upwards," at £189,497, the total length being three hundred and two miles. This did not include the work at Little Falls, which had been completed. An alternate route to join the Hudson at Waterford was estimated at £192,769, with a distance of 299 miles.

The aid from the State, to which the directors referred in their report, was granted on March 31, 1795, when the Legislature passed an act directing the State Treasurer to subscribe two hundred shares to the stock of each company. This was in answer

²⁷*Report of the Directors, etc., pp. 4-5.*

to a petition from the directors representing that only seven hundred and forty-three shares had been subscribed to the Western Company, and six hundred and seventy-six to the Northern Company, and of these about two hundred and forty in each company had been forfeited by reason of the subscribers not paying the required amounts.

It was becoming evident that the proposed improvements were too onerous for the companies to prosecute unaided, and the Legislature, from time to time, granted appropriations and loans. An act of April 1, 1796, offered aid in extending the improvements down the Hudson to Albany. This act provided that the directors of the Northern Company should employ an able engineer to examine the river from Albany to the mouth of a creek north of Troy, called Meadow creek, to determine the practicability of improving the channel so as to obtain navigation for boats of six feet draught, and to estimate the cost of this work. If the cost did not exceed four thousand pounds, and if one thousand pounds were raised by voluntary contribution, then the State Treasurer was authorized to pay to the company three thousand pounds. The act further provided for the payment of fifteen hundred pounds for improving the river from Meadow creek to Mill creek, the point where the Northern Company was to begin operations, if the engineer's estimate of cost did not exceed two thousand pounds and provided that five hundred pounds were raised by contribution.

By the act of April 11, 1796, the State loaned fifteen thousand pounds (thirty-seven thousand five hundred dollars) to the Western Company, taking a mortgage on the canal and locks at Little Falls.

By the act of March 17, 1797, the sum of three thousand pounds was appropriated for the work of improving the Hudson to Albany, contemplated by the act of April 1, 1796. William Weston, the engineer employed to prepare the plans, estimated that the cost would exceed four thousand pounds, but the Legislature appropriated the amount promised by the former act, upon condition that the deficiency be raised by contribution. The act further specified that the work should be done according to the plans of the engineer, which called for a double row of piles with side stringers and ties, and stone filling. In after years various

schemes were tried, but finally a plan similar to this first method has been adopted as best,—to confine the river between parallel dykes, so that the current will keep the channel open.

On March 17, 1797, was passed another act which provided for the borrowing of two hundred and fifty thousand dollars by the Western Company.

As funds were provided, work was carried on at various places, so that navigation was considerably bettered, but the expectations of the projectors were never fully realized and it is even doubtful whether the improvements proved to be of much lasting benefit. In the following quotations from two writers of the time (Elkanah Watson and De Witt Clinton), two views of the success of the enterprise are presented. Mr. Watson, it must be remembered, was one of the directors of the company, and was intimately connected with the inception and projection of the scheme, while to De Witt Clinton's energy was largely due the successful completion of the Erie canal, but it must be remembered also that Clinton's writings—particularly this one—evinced a tendency to belittle the whole early project, that the glory of the Erie and of himself as its chief promoter might be the greater.

Mr. Watson says in his *History . . . of the Western Canals*:—

“In 1791, I had estimated \$200,000, as the highest possible sum to open a lock navigation from the Hudson river to the Seneca lake; instead of which, there was expended, to December, 1804, from Schenectady to the Seneca falls, \$367,743, and subsequently the amount was swelled to \$480,000. . . .

“It will be seen, however, by the following report, furnished by Barent Bleeker, Esq., late treasurer of the old canal company, how grossly both the committee and myself were deceived by the result. . . .

“It will be recollected, that the wooden locks at the Little Falls, Germanflats, and Rome, rotted away in about six years;—that they were rebuilt, at the two last places, with brick, which again failed, by the badness of the mortar. Under the superintendence of Mr. Weston, they were all permanently rebuilt with stone;—hence the expenditures baffled all calculation,—besides, we were all novices in this department, as to practical experience, as the event demonstrated. Indeed we were so extremely deficient

in a knowledge of the science of constructing locks and canals, that we found it expedient to send a committee of respectable mechanics, to examine the imperfect works then constructing on the Potowmac, for the purpose of gaining information,—we had no other resource but from books. . . .

“The whole amount expended as above, to December, 1804,
was \$367,743.

“Which arose thus—

Paid on 2630 shares, capital stock	\$232,000.	
Received on forfeited shares,	25,494.	
Received on tolls at Little Falls, from 1796 to 1804, inclusive,	58,346.	
Received at Rome,	15,037.	
Received, gift of the state,	12,500.	
Received, sales of sundry materials,	2,869.	
Due by the company in 1804, since paid,	21,497.	
		<hr/>
		\$367,743.
		<hr/>
Of the above stock the state held,		\$92,000.
By the stockholders,		140,000.
		<hr/>
Capital stock,		\$232,000.
		<hr/>

“On the above there was paid to the stockholders, viz.

In 1798, a dividend of 3 per cent.

1813,	do	3½
1814,	do	3
1815,	do	4½
1816,	do	8
1817,	do	3
1818,	do	5½

The revenue from 1798 to 1813, was absorbed in repairs and improvements.

“Mr. Bleecker considers, that if the grand canal had not taken place, the prospect for the old canal would at this time, (March, 1820,) become settled for a permanent, and increasing revenue,—and that when the eastern section shall be completed, the old

canal and locks will be only in partial use, and the stock of little value. Also, that about \$100,000 was expended on the northern canal, under the law of 1792; no part of which, I am informed, has been of the least use to the new canals, in consequence a total loss."³⁸

"By the completion of the works along the Mohawk river, Wood creek, and down Onondaga and up Seneca rivers, in 1796, boats of a different construction, carrying from fifteen to sixteen tons, were introduced, and the price of transportation was reduced to about thirty-two dollars per ton, from Schenectady to the Seneca falls, and half that sum on returned cargoes. . . . By the great reduction of the transportation, in consequence of the opening of the old canals, in 1796, it actually doubled the intrinsic value of lands and produce on these waters."³⁹

"The completion of the old canals, in 1796, excited a lively jealousy in Pennsylvania, as will be seen by the following extract from a speech of Gov. Mifflin's, to the legislature, in 1796.

" 'Permit me earnestly to recommend a liberal perseverance in extending, and facilitating, a communication between different parts of this state, by roads and canals. Indeed the spirited examples *which your predecessors gave*, has excited in one of our sister states, an emulation so active, as to demand some extraordinary exertions on our part, to retain a just portion of the benefits arising from an intercourse with the lakes, and western waters, to which our local position, and other natural advantages, have justly entitled us.' "⁴⁰

In Clinton's *Canal Policy* we read:—

"Some work was done by the northern company, between Waterford and Stillwater, and at Whitehall; but this incorporation was dissolved without effecting any thing beneficial.

"In April, 1793, the western company commenced their work at the portage of the Little Falls, with 300 labourers, and a number of artificers, and after meeting with various impediments, a canal of 4,752 feet long, and 3 feet deep, and 5 locks of 9 feet lift each, with a chamber to each of 74 by 12 feet, was so far completed as to afford a passage to boats at this place.

³⁸Watson's *History* . . . of the Western Canals, p. 92, et seq.

³⁹*Id.* p. 98.

⁴⁰*Id.* p. 102.

"On the 3rd of October, 1797, a canal for the passage of boats from the Mohawk river to Wood creek was completed. The length of this canal is one mile and three quarters, and its width 47½ feet—and it may be used by boats drawing 3½ feet water. It has two locks, one of 10, and the other of 8 feet lift, and a feeder.

"A few months after, a canal of a mile and one fourth long, 24 feet wide, and 4 deep, with 2 locks, was finished at the German Flatts; and the navigation of Wood creek has been since improved by locks and deep cuttings; and attempts have been made at different times to facilitate the Mohawk communication by dams, &c., which have been almost always unsuccessful.

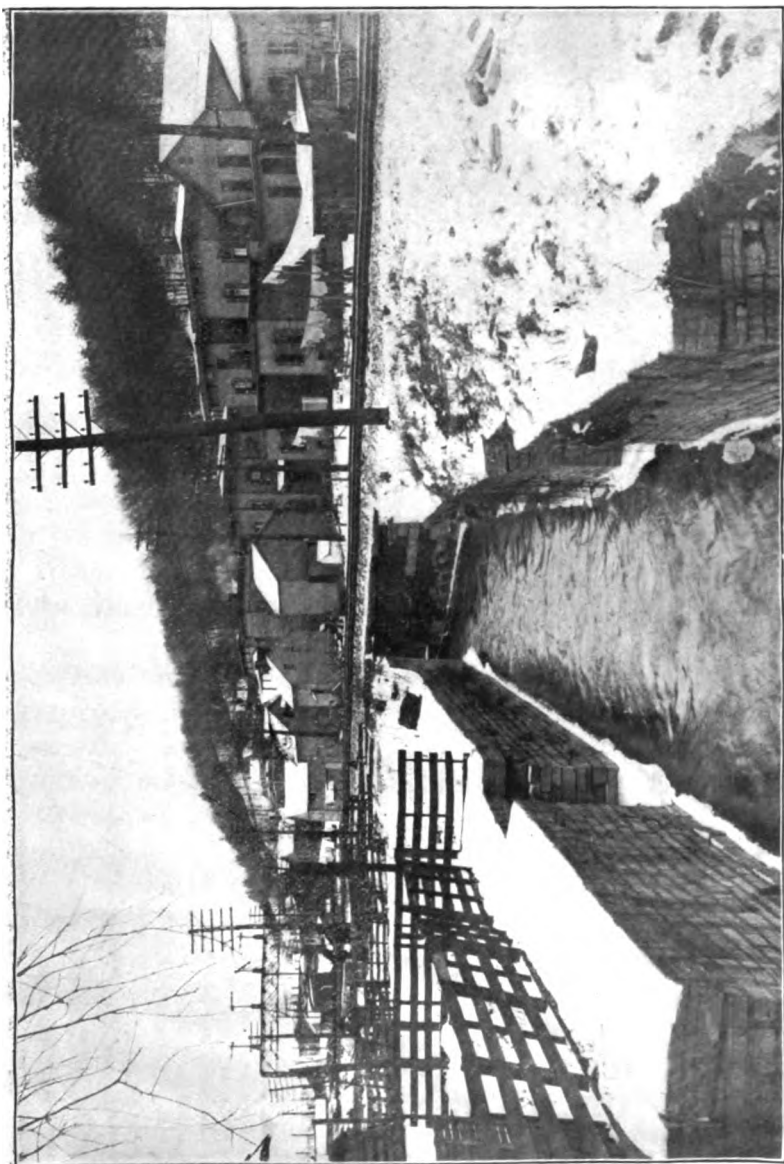
"This company in their report to the legislature, of the 16th of February, 1798, disclaim all idea of a canal along the banks of the Mohawk, east of the Little Falls. Its only object appeared to be the improvements west of that place.

"On the 11th of April, 1808, the western company surrendered all its grant west of the Oneida lake. . . .

"The causes of the total failure of the northern, and the partial failure of the western canal, are principally the following:—

"1. The want of able American engineers. No genius can supply the absence of experience and instruction. . . . General Schuyler was a man of great talents; but he was not a practical engineer. In the first stages of the undertaking, he superintended the whole operation, not only as president of both companies, but as civil engineer. The work was too mighty for his grasp.

"At a subsequent period, Mr. Weston, a celebrated English engineer, was employed; but he was totally ignorant of the country and the people. Hence between them both great mistakes were committed. Mr. Weston involved the company in great expense by an unnecessary deep cutting at Rome, which might easily have been avoided, by diverging a little through a swamp. The artificial bank of the canal at the Little Falls, was supported on the inside by a dry wall, which cost \$15,000. This was found worse than useless; it served as a sieve to carry off the waters and to injure the bank, and it became necessary to remove it.



LOCK AT LITTLE FALLS, BUILT BY THE WESTERN INLAND LOCK NAVIGATION COMPANY ABOUT 1800. View showing its present condition; the channel is now used as a head-race. In 1883 the Legislature transferred this lock, together with an adjacent stone bridge, to a commission for preservation as a historical relic.

"The locks at Rome were originally made of brick, which not standing the frost, were replaced by stone: those at the Little Falls were built of wood, which soon rotting, stone was substituted—and these seven locks probably put the company to an unnecessary expense of \$70,000.

"There is a fine stone quarry a mile and a half from the Little Falls, of which the locks were made, after having been built of wood from ignorance of the vicinity of this stone. . . .

"2. The high demand for damages, made by the proprietors of the lands through which the canal passed, and which were generally allowed. . . .

"3. The *modus operandi*. Instead of operating through contractors, superintendents and labourers were employed, and paid by the day or the month. The consequence was, that the company was liable to be defrauded in every direction.

"4. The great defect was the want of funds—and this naturally arose from the magnitude of the undertaking. It was too great for any individual or company, and it ought never to have gone out of the hands of the state."⁴¹

As to the benefits conferred, Mr. Clinton says: "The water improvements to the north were abandoned, and those to the west were of little consequence. Two of the Portages only were surmounted, namely, at the Little Falls and at Rome—That between Albany and Schenectady, and that at the Oswego Falls were never touched—and the attempts to deepen the channels of the rivers, and to shorten the distances, were generally unavailing and fruitless. The expense of transportation continued the same by water as by land—and no important facilities were created for the transportation of commodities."⁴²

"The inauspicious results of the attempts of the western company arrested for a long time the progress of internal navigation. An incorporated company had afterwards made canals and locks on the Seneca river west of Cayuga lake, and an enterprising individual, of the name of Baldwin, had in one place made improvements below—and this was the sum total of all such operations."⁴³

⁴¹*The Canal Policy of the State of New York*, by Tacitus (De Witt Clinton), pp. 16-17.

⁴²*Id.* p. vi.

⁴³*Id.* p. 19.

"The operations of the Western Inland Lock Navigation Company, however laudable for good intentions, were unfortunately calculated to dampen the zeal for internal navigation and to arrest its progress. The most popular and the strongest argument urged against the great system of Canal policy, was the failure of their attempts; and it may be truly said, that if that association had never had a being, the most serious obstacles which have been thrown in the way of our present measures would have never existed."⁴⁴

Of the same opinion was another early advocate of the Erie canal, who said: "It is a truth which ought not to be disguised, that the gross errors which were committed by the advocates of that scheme, in their estimates of the expense, and of the profits and advantages of those improvements, resulted in a complete failure of the benefits promised by its projectors. . . . Certain I am, that instead of facilitating, and encouraging subsequent canal operations, the history and experience of the Northern and Western Inland Lock Navigation Companies were powerful impediments to the enterprise of the Erie Canal."⁴⁵

An interesting bit of local history at Rome proves that the failure of the locks was not due to the poor quality of the bricks. These bricks, which were slightly larger than an ordinary building brick, after being removed from the locks, were used in constructing the first Court House in Rome, about 1806. This structure stood till 1848, when it was destroyed by fire. Then the bricks were used for a third time in a dwelling, which is still standing at the northeast corner of George and Court streets, in a state of good preservation. Probably the failure was due, as Mr. Watson said, to the poor quality of the mortar. Add to this deficiency the fact that the material was composed of small bricks rather than of large stones, and the failure is easily accounted for.

While the Western Inland Lock Navigation Company was endeavoring to open navigation to the central part of the state, the incorporation of another company was authorized for the purpose of completing communication with the Great Lakes.

⁴⁴*The Canal Policy of the State of New York*, p. viii.

⁴⁵Letter of Judge Platt to Dr. Hosack in *Memoir of De Witt Clinton*, p. 380. (New York, 1829.)

On April 5, 1798, was enacted the first law toward constructing a canal from Lake Erie to Lake Ontario. During the session of 1797, a similar bill had passed the Assembly, was amended by the Senate, but was laid aside in its amended form by the Assembly. This act of 1798 incorporated the Niagara Canal Company, and provided for a canal large enough for boats seventy feet long by sixteen feet wide and having a draught of four feet. The company was granted ten years in which to complete the canal. The contemplated route was seven miles long, having a descent of three hundred and twenty feet, and the estimated cost was half a million dollars for large boats, and double that sum for boats of seventy tons burden.

The law established a company for the purpose of opening a canal and lock navigation, to commence at Stedman's landing above the falls with a termination nearly opposite Queenstown. In 1796, surveys, levels and estimates were made by Benjamin Prescott, who was one of those interested in procuring the passage of the law. He estimated the expense of the project at \$623,000 for a canal to accommodate large boats, and at \$1,000,000 for sloops of seventy tons burden.

The organization of the company was perfected in 1799, with the election of James Watson as president, and Messrs. Prescott and E. Watson, two of the directors, were delegated as a committee to furnish the information that had been procured on the subject. A detailed report was made, "in which they (the directors) enlarged upon the great importance of the object in view, and presented various estimates of the expense of the canal, and of the tolls which would probably proceed from it if completed. But as the whole amount of tolls which were then expected to be received from the canal, were estimated at only \$14,000 per annum, and as the interest of the monies to be expended in the construction of the works would have exceeded \$40,000 per annum, the committee advised that the immediate execution of the work ought not to be attempted, but expressed a decided conviction 'that in a few years the all important enterprise would be found both necessary and indispensable.'"⁴⁸ Subsequently Mr. La Trobe, a French engineer, was employed

⁴⁸Supplement to Troup's *Letter to Brockholst Livingston* . . . on the *Lake Canal Policy*, pp. 5-6. (Albany, 1822.)

by the company to resurvey the route. He performed the work and presented new levels and estimates to the directors, and although the project excited much interest at the time, no other effort was made towards its consummation.

From a letter of Benjamin Wright may be learned the few subsequent operations by the Western Company. He says:—

“After Mr. Weston had completed the improvements at Rome, or Fort Stanwix, and a short cut and two locks at German Flatts, in Herkimer county, which was completed about the year 1798–99, he soon after returned to England, his native country.

“In 1802, the Western Inland Lock Navigation Company determined upon improving the navigation of Wood Creek from near Fort Stanwix to a small tributary stream six miles westerly, called Little Canada Creek. In this distance there was a descent of nearly twenty-four feet, and the navigation very indifferent and troublesome. The plan decided upon was by means of dams and locks, of which they constructed four in the distance above mentioned. George Huntington, Esq., of Rome, was their agent, and I was their engineer.

“After locating and determining all that was necessary for these works, the gentlemen composing the board of directors, of which General Schuyler was president, and Robert Bowne and Thomas Eddy two very prominent and active members, were so well satisfied with my manner of executing the duties of civil engineer, that they directed me to make a traverse and regular survey, ground plan, and profile of the Wood Creek, from the point at Little Canada Creek, before mentioned (where the improvements of 1802 ended) down to the Oneida Lake, where Wood Creek empties its waters. This I performed in the spring of 1803.

“Immediately on completing my work on Wood Creek, and returning the maps, plans, reports, &c. I received further directions from the president and directors to commence a survey of the Mohawk River from Fort Stanwix to Schenectady—taking a regular traverse of the river, so as to show all its windings, its breadth, the descent in each rapid, and the descent between rapids, the depth of water in the channel at each rapid, and the depth in each pool between rapids at its lowest summer drought, the height of alluvial banks and all other remarks and

observations which I might think useful.'—'And as a final duty, to strike out my own plan of improving the river in as cheap and economical a manner as possible, and one adapted to the situation and circumstances of the company.'

"This duty I performed in 1803, by recommending a compound of dams, locks, and short canals, so as to make a slack water navigation upon the cheapest possible and useful plan. Unfortunately the pecuniary affairs of the company never permitted them to carry any part of the proposed plan into effect.

"Things remained in their then state until the resolution of Judge Forman, in February, 1808, in the Assembly, he being at that time a member from Onondaga county, and myself a member from Oneida."⁴⁷

Many years were required to mature the next project. The work already done facilitated traffic to a limited extent, but the need of something better was felt, and the people were not then ready to commence the great undertaking which the situation demanded.

⁴⁷Letter to Dr. Hosack in *Memoir of De Witt Clinton*, pp. 501-502.

CHAPTER II.

BUILDING THE ERIE.

From the inception of the idea of an internal route to the opening of the completed canal.

The beginning of the Erie or Grand canal, as it was first called, marks a distinct era in the internal navigation of the state. This canal differed from the works of the old Lock Navigation Company in two important respects,—in being a channel independent of natural streams, and in following an interior route from Rome to Lake Erie. The difficulties of maintaining navigation by the old company led to the adoption of the English rule of avoiding natural streams. The importance of an interior route was much more evident at that time than now. At first the chief objection to going by way of Lake Ontario was the fear lest commerce, once started in that direction, should continue down the St. Lawrence, and so out of the country. At that day the great West was not so firmly bound to the United States as at present, and the fear was evidently well grounded. When the practicability of an interior canal was established, the development of western New York by a canal through its midst, and the saving of so much lockage as the Ontario route would require, were important factors in determining the route. However, so well established in the public mind was this idea of the Ontario route, that, when in 1808 the first proposition was made in the Legislature to authorize a survey directly from the Hudson to Lake Erie, the members would not take the responsibility of so wild a scheme, and ordered the Surveyor-General to investigate along "the usual route of communication between the Hudson river and lake Erie, and such other contemplated route as he may deem proper."

The works of improvement by the Western Navigation Company served the purpose of awakening public interest, and to a small extent developed the interior, but they fell far short of meeting the needs, and many years were required to educate the people to the point of sanctioning so great an undertaking as the conditions required. The early promoters were not only

considered dreamers and visionary enthusiasts, but endured obloquy, abuse and insult. Not until the work of construction had been in progress for three years and the middle section had been opened, did the opposition cease and the people become united in an endeavor to complete the enterprise which they expected to bring prosperity to themselves and to give to their State the controlling power in the commerce of the country.

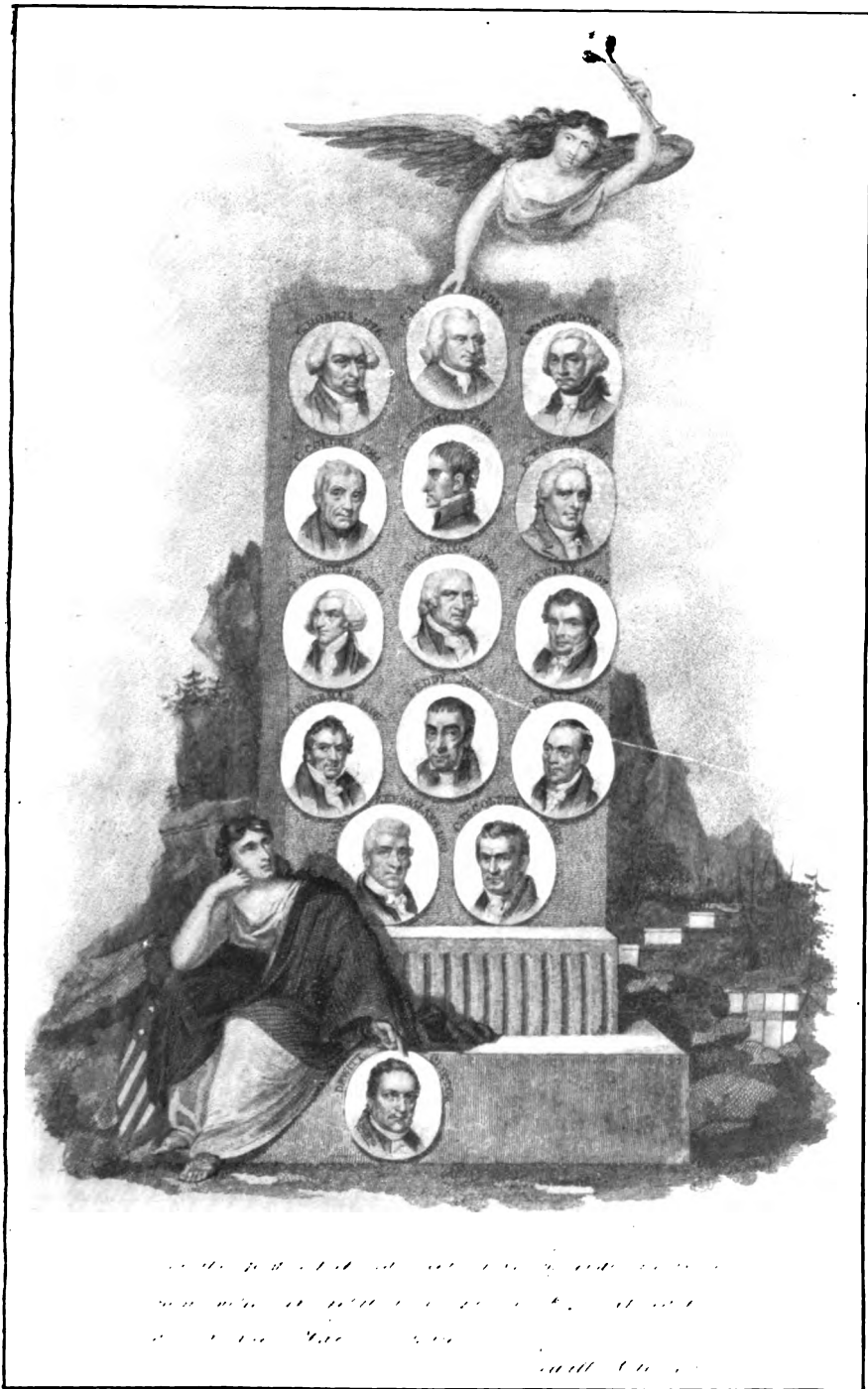
Standing at a point of time nearly ninety years removed from the beginning of the canal, we can hardly appreciate the difficulties of the early builders. The nation was young and its monetary resources small. Our whole state had but one-eighth of the population of New York City to-day. To the great majority of the people canals were only a name. Engineering was an unknown profession in America, and of contractors there were none. Excavating machinery was still to be invented, and the track of the canal was an unbroken forest or a miasmal marsh. To add to the difficulties, sectional prejudices were developed, the older and more influential East fearing to compete with the developing grain industry of western New York. The men to champion this cause were necessarily of a strong and determined character, and such as to incite the political antagonism which arrayed itself against the project. The conservative, as ever, were fearful lest it were, as Jefferson said, a century too soon, and lest the State should become bankrupt by the undertaking. The National Government would not aid even by granting its unsaleable western lands, which the canal eventually transformed into flourishing States. And strangest of all, when legislative action to authorize construction was pending, all of the members from New York City, which the canal was destined to make the commercial metropolis of the continent, were bitterly opposed.

But alone and unaided the State began the work and carried it to a successful completion. From among her own citizens commissioners, engineers and contractors were found capable of performing the great task. The solving of many difficulties trained the engineers to such a degree that they were sought for public works all over the land. Contractors, who were so deficient as to need a loan from the State of a few hundred dollars, for purchasing their tools and supplies, accomplished their work

with despatch. At the end of eight years, after having completed nearly four hundred and fifty miles of canals, many of these men were aboard the first boat that sailed from Buffalo to New York in a celebration such as the world had never seen. And well might they rejoice over a task so perfectly, so economically and so quickly done, and one which was so nearly to fulfill their expectations in bringing added strength and prosperity to the land. As we cannot easily appreciate the difficulties which confronted the builders, neither do we readily perceive how much the opening of such a means of communication meant to the people of that day. Viewed from the conditions of the time, their extravagant rejoicings seem entirely fitting.

When it was seen that the undertaking was to be so eminently successful, the question naturally arose as to the originator of the idea, and many were the claimants for this honor. So great was the contest among these rival claimants that the many books and pamphlets on the subject are marked by sharp invective and stinging sarcasm. Not only during the early years of the canal was this controversy waged, but even as late as 1866, it was reopened. Whatever may be our opinion upon the mooted question, we must rejoice that this contention induced the publication of much valuable material that otherwise might have been irrevocably lost to history. Dr. David Hosack, in the Appendix of his *Memoir of De Witt Clinton*, has treated of this subject most exhaustively, and some papers contained in the second volume of the *Publications of the Buffalo Historical Society* also ably discuss it. Dr. Hosack has published letters from many men prominent in canal affairs, which give interesting facts about much of the early history not contained in any official records.

At this late day no one can hope to decide the question, nor, indeed, does it seem of great moment to decide it. After carefully investigating all that has been written upon the subject and comparing the contradictory statements, we are forced to agree with Judge Platt, a man well versed in the early history of the State and intimately connected with the first propositions for a canal, when he says, "As to the merit of the first design of a canal, directly from Lake Erie to the Hudson, it belongs, in my opinion, exclusively, to no person. It was gradually developed to



EARLY CANAL ADVOCATES.

Reproduced from an engraving in Dr. Hosack's *Memoir of De Witt Clinton*. They are: Gouverneur Morris, Cadwallader Colden, George Washington, Christopher Colles, Jeffrey Smith, Elkanah Watson, Philip Schuyler, George Clinton, Jesse Hawley, Joshua Foreman, Thomas Eddy, Jonas Platt, Stephen Van Rensselaer, Cadwallader D. Colden and De Witt Clinton.

the minds of many who were early acquainted with the geography and topography of the western region of this state."¹

As the beginnings of important undertakings are always of interest and as the services of all of these early advocates of the canal were so great, their zeal amid discouragements so staunch, and their only reward, the plaudits of their fellows and the renown of historical record, it is deemed fitting to enter into the account of the inception and building of the original Erie canal with considerable detail.

This is not the proper place to discuss, beyond a brief review, the relative merits of these rival claimants, but such deeds of these men as influenced public action deserve attention. As told in the previous chapter, Cadwallader Colden, in 1724, suggested the first idea that a canal might be built from the head waters of Seneca river to Lake Erie, and the legislative *Journal* of 1786 shows that Jeffrey Smith introduced a bill "for improving the navigation of the Mohawk river, Wood creek, and the Onondaga river . . . and for extending the same, if practicable to Lake Erie." Mr. Smith probably received his views from Christopher Colles. These men are not usually considered among the claimants for originating the idea of the Erie.

Among the directors of the Inland Lock Navigation Companies, claims have been advanced for Elkanah Watson, for General Schuyler and for Thomas Eddy, as first conceiving a notion of an interior route to Lake Erie. But Mr. Watson admitted that his thought never went beyond Seneca lake. Of General Schuyler's ideas the following letter gives a clue. The writer says:

"In the year 1797, I was frequently at the Little Falls, where I saw General Philip Schuyler, and Mr. Weston the engineer. I stayed at the same house with them at that place for six or seven days together, and heard almost every day conversations between them on the subject of internal navigation. Their views went far beyond the projects then authorised by law; they frequently talked of water communications, by means of canals, as far as Lake Erie, keeping the interior, so as to avoid the Niagara Falls, provided the face of the country would admit of a different route. Good policy, as it respected our contiguity to

¹Letter from Jonas Platt to Dr. Hosack, in *Memoir of De Witt Clinton*, by David Hosack, p. 381. (New York, 1829.)

the Canadas, as well as the principles of canalling, so well understood, and the benefits arising from it, forbade the route by the way of Lake Ontario. But they considered the period remote, when this great system of canalling was to be adopted. At the time I speak of, it was supposed that neither the infant state of the country, nor public opinion, would allow of any other steps towards internal improvements, than those already sanctioned by law. Their whole views were therefore bent on perfecting the navigation from the Hudson to the Seneca Lake, and the harbour of Oswego, in conformity to the law of 1792.”²

To Thomas Eddy is ascribed one of the first steps in the project. He was treasurer of the Western Company and is said to have first suggested the plan of uniting the Seneca and Mohawk rivers by a direct canal. Through his efforts the board of directors ordered the route to be explored, and estimates to be made. In accordance with this act, in 1796, Mr. Eddy, in company with William Weston, the English engineer, and a party of surveyors, investigated a route and made a favorable report, but for the want of funds, there the matter rested. Not until years later did he appear to consider a canal to Lake Erie, but his was probably the first idea of an interior route to begin at Rome.

To Gouverneur Morris has generally been accorded the honor of originating the idea of the Erie canal. Mr. Morris was prominent in National affairs, and was destined to become closely allied with the early canal projects. His biographer, Jared Sparks, gives many facts in support of the claim to this honor.³ He quotes from a letter of Governor Morgan Lewis to Harmanus Bleecker, in which he said of a conversation he had with Morris in 1777: “ . . . he announced, in language highly poetic, and to which I cannot do justice, that at no very distant day the waters of the great western inland seas would, by the aid of man, break through the barriers and mingle with those of the Hudson. I recollect asking him how they were to break through these barriers. To which he replied, that numerous streams passed them through natural channels, and that artificial ones

²Letter of Major James Cochrane to Moses I. Cantine, dated Utica, Feb. 10, 1822, in Appendix (p. 1) to Supplement of Troup's *Letter to Brockholst Livingston . . . on the Lake Canal Policy*. (Albany, 1822.)

³*Life of Gouverneur Morris*, Vol. I., pp. 495-500.

might be conducted by the same routes." On December 20, 1800, after returning from a journey to Niagara falls and Lake Erie, Mr. Morris said, in writing to a friend in Europe, Mr. John Parish: " . . . one-tenth of the expense, borne by Britain in the last campaign, would enable ships to sail from London through Hudson's River into Lake Erie." It is related that soon after writing this letter, while in company with a number of prominent men in Washington he gave expression to similar views, and suggested the scheme of an inclined plane, which, in after years, he incorporated in a report to the Legislature. Simeon De Witt, for many years Surveyor-General, said in a letter, dated February 25, 1822, to William Darby, who had requested material for an encyclopedia, that his first intimation of this idea came from Mr. Morris, in 1803, when he "mentioned the project of tapping Lake Erie, as he expressed himself, and leading its waters in an artificial river, directly across the country to the Hudson River." James Geddes said that he heard it for the first time, in 1804, from the Surveyor-General. In spite of all this testimony, there is reason to doubt whether prior to the survey of Mr. Geddes, in 1808, Mr. Morris had any idea of the country through the interior, or of any route to Lake Erie other than by Lake Ontario and around Niagara falls by a canal. Mr. Morris had died before this controversy arose, and his friends based their arguments upon his letter to Mr. Parish in 1800, upon an entry in his diary of 1803, and upon the evidence of Simeon De Witt and Governor Morgan Lewis. It should be observed that Mr. De Witt's evidence was the report from memory of a conversation, after a lapse of nineteen years, and that Governor Lewis' letter was likewise from memory, fifty-one years after the reported conversation. These letters are offset by the testimony of Charles Broadhead and Benjamin Wright, early engineers, and Thomas Eddy, one of the first canal commissioners, who knew Mr. Morris during the time of his reputed proposals for an interior canal, and who stated as their opinion that his first ideas were of a communication along the natural waterways. The entry in his diary really sustains this same view. The letter to Mr. Parish, in 1800, describes a trip to Lake Erie by way of the Hudson river, Lakes George and Champlain, the St. Lawrence, Lake Ontario, and around Niagara. The language of the letter, "through Hudson's River into Lake

Erie," defines no route, and its evidence as a proof of the claim is entirely annulled by a subsequent letter which Mr. Morris wrote to General Henry Lee, on January 22, 1801, in answer to a request from General Lee that he commit to paper his ideas in full, that the nation might be brought to adopt the scheme. In reply Mr. Morris describes "the navigation between the Hudson and Lake Ontario, by the Mohawk and Wood Creek," and says that as far as he can "judge from observation and information, it is not only practicable, but easy, though expensive." At best Mr. Morris' idea would have availed nothing without the efforts of someone to induce public action. The consensus of opinion is that Mr. Morris, though brilliant, was visionary and impractical.

Each of the two other men, Jesse Hawley and Joshua Forman, who claim attention as originating the idea of the Erie, did something that materially aided in accomplishing the work. A popular idea that De Witt Clinton was instrumental in inaugurating the project has no foundation in fact. Early in its history, at the solicitation of the projectors, Clinton entered heartily into the scheme and remained the master spirit till its consummation, but although others claimed it for him, he never claimed for himself the original idea of the canal.

To Jesse Hawley belongs the honor of first formulating the definite scheme which culminated in building the Erie canal and probably to him belongs the honor also of first suggesting the idea of the interior route. In a letter to Dr. Hosack he says: "In April 1805, . . . I suggested the idea of an overland canal from the foot of Lake Erie, at Buffalo, . . . to Utica, and thence down the Mohawk to Hudson River."⁴

Mr. Merwin S. Hawley thus describes the occurrence:

"The writer of these pages well remembers, when a boy, hearing Mr. Hawley relate the incident of his *first* suggesting the idea of the overland canal. He was at Colonel Mynderse's office in 1805, attending to the shipment of some flour to market, by the circuitous and uncertain route then in use. Himself and Colonel Mynderse conversing upon the necessities for better facilities, Mr. Hawley said, 'Why not have a canal extend direct into our country, and benefit all—merchants, millers, and farmers?' To which Colonel Mynderse replied, that it could not be

⁴*Memoir of De Witt Clinton*, p. 301.

done, for the lack of a head of water. As the head of water was so essential to the idea, Mr. Hawley felt somewhat chagrined at first, that he should have made such a blunder; but, stepping to an old map of the State, which hung on the office wall, he put his finger on the point where they were located, and tracing along on the map to Niagara Falls, and to Lake Erie, said, 'There is the head, there is the supply of water.'

"The idea, thus brought out, being treated as visionary, Mr. Hawley was stimulated to examine it, and he became more convinced of its practicability the more he investigated it, although, as he became earnest upon the subject, his friends ridiculed the idea as visionary or chimerical; and, after publishing one or two of the essays, the printer objected to inserting any more, as the ridicule they received was liable to injure the character and circulation of his paper."⁵

Opposed to Mr. Hawley's positive statement that the idea of the canal was original with himself, is the equally positive declaration of James Geddes that he discussed Mr. Morris' suggestion of "tapping Lake Erie" with Mr. Hawley prior to April 5, 1805, the day on which Mr. Hawley claimed that the idea occurred to him.

To give expression to his views on this subject, Mr. Hawley wrote fifteen essays on inland navigation, under the signature of "Hercules." The introductory article was published on January 14, 1807, in a paper called the *Commonwealth*, at Pittsburg, Pennsylvania, whither Mr. Hawley had removed. Having returned to Ontario county, he determined to render himself useful to society, as he expresses it, by giving publicity to his suggestion. On October 27, 1807, he contributed the first of a series of fourteen essays, which appeared in the *Genesee Messenger*, a paper published in Canandaigua. The series was concluded in the following April. They were the subject of much ridicule, and considered, by some, as "the effusions of a maniac," the writer being unknown for some time. He declared his chief object in writing the articles to be "to induce a belief in the propriety of an actual survey," saying: "I intend to point out that improvement which I conceive to be of the greatest importance of any which can be undertaken in the United States; and for the prop-

⁵*Publications of the Buffalo Historical Society, Vol. II., pp. 242-244.*

osition of which these numbers were principally written—
A CANAL FROM THE FOOT OF LAKE ERIE INTO THE MOHAWK.”⁶

President Jefferson in his second inaugural address, March, 1805, had promulgated the idea of appropriating the surplus revenue of the United States, after the payment of the National debt, to the improvement of canals, roads, etc., and in his message, December, 1806, he had shown that there was a greater surplus of revenue than was anticipated at the time the terms for the discharge of the National debt were stipulated. For the use of this surplus he had suggested its application to the improvement of some great National object, the undertaking of which was to be immediately commenced. In reply to these utterances of the President, Mr. Hawley, in his introductory essay, presumed to suggest that the “improvement, which would afford the most immediate, and consequently the most extensive advantages” in the United States, was “connecting the waters of *Lake Erie* and those of the *Mohawk* and *Hudson* rivers by means of a canal.” He then described the route of the proposed channel across the state, and in the subsequent essays he traced this course with considerable detail, calculated the distances and elevations, and even estimated the cost at six million dollars, a very accurate estimate, as the actual cost proved. Indeed, so nearly did the canal, when built, follow the line he had marked out, and so fully and rapidly were his predictions verified in regard to the benefits that would result, that these writings may be regarded as almost prophetic. His plan, however, was that of an inclined plane, which, although introduced in the first canal commissioners’ report, was eventually discarded as impracticable. How much influence these papers exerted in that day of limited circulation of country newspapers, it is impossible to tell. It is certain that subsequently they were duly honored and appreciated. They were finally deposited with the Historical Society of New York City, and may be found, reprinted in full, in Dr. Hosack’s *Memoir of De Witt Clinton*.

The last claimant for originating the idea of the Erie is Joshua Forman, the man who introduced in the Legislature the resolution ordering the survey which demonstrated the practicability of an overland route. During the legislative session of 1807-8,

⁶Hosack’s *Memoir of De Witt Clinton*, pp. 311 and 313. (New York, 1829.)

Mr. Forman, a member of Assembly from Onondaga county, and Benjamin Wright, a member from Oneida county, were room-mates. In describing the circumstances attending the resolution, Mr. Forman said that one evening while reading the article on canals in *Rees' Cyclopaedia*, and observing the relative importance of canals over improved rivers, he perceived how much more beneficial such a canal would be than the old works on the Mohawk, and the thought occurred to him that, if a canal were ever built between the Hudson and the western lakes, it would be worth more than the extra cost to go directly through the country to Lake Erie. Judge Wright and General McNeil being with him at the time, he discussed the subject with them, and finally it was agreed that Mr. Forman should introduce a joint resolution and Mr. Wright should second it. Accordingly this plan was carried out and it lay on the table for one day by the rules of the House.

In opposition to Forman's claims to originality and also his declaration that he had never heard of Morris' schemes or Hawley's essays, may be mentioned the statement of one of his biographers' that he was elected on what was known as the "Canal Ticket," with the avowed purpose of introducing legislative action for promoting canals, and the evidence of one of his neighbors that he had heard Judge Forman discuss Hawley's essays at the time of their publication."

Mr. Forman said that, without much confidence that the National Government would construct such a canal, he framed the resolution to take advantage of the President's proposition to use the surplus revenues in making roads and canals, for, if the project had been treated as a work for the State alone, it would have been denied attention by the Legislature. Even in that form it was received with astonishment and ridicule, but being ably defended by Judge Forman it was adopted on the ground "that it *could do no harm, and might do some good.*"

The record of this legislative action is found in the following extracts from the Assembly and Senate *Journals*:—

'Joshua V. H. Clark in History of Onondaga county, entitled *Onondaga or Reminiscences of Earlier and Later Times*, Vol. II., p. 72. (Syracuse, 1849.)

Also, *Publications of the Buffalo Historical Society*, Vol. II., pp. 299-301.

Publications of the Buffalo Historical Society, Vol. II., pp. 347-348.

Hosack's Memoir of De Witt Clinton, p. 346.

In Assembly, February 4, 1808, "Mr. Forman called up the resolution heretofore submitted and ordered to lie on the table; which being read, was agreed to, in the words following, to wit:

"Whereas the president of the United-States, by his message to congress, delivered at their meeting in October last, did recommend, that the surplus monies in the treasury, over and above such sums as could be applied to the extinguishment of the national debt, be appropriated to the great national objects of opening canals and making turnpike roads. And whereas the state of New York, holding the first commercial rank in the United States, possesses within herself the best route of communication between the Atlantic and western waters, by means of a canal between the tide waters of the Hudson river and lake Erie, thro' which the wealth and trade of that large portion of the union, bordering on the upper lakes, would forever flow to our great commercial emporium. And whereas the legislatures of several of our sister states have made great exertions to secure to their own states, the trade of that widely extended country west of the Alleghanies, under natural advantages vastly inferior to those of this state. And whereas it is highly important, that those advantages should as speedily as possible be improved, both to preserve and increase the commercial and national importance of this state. Therefore,

"*Resolved*, (if the honorable the senate concur herein) That a joint committee be appointed to take into consideration the propriety of exploring, and causing an accurate survey to be made of the most eligible and direct route for a canal, to open a communication between the tide waters of the Hudson river and lake Erie, to the end that congress may be enabled to appropriate, such sums as may be necessary to the accomplishment of that great national object, and in case of such concurrence, that Mr. Gold, Mr. Gilbert, Mr. Forman, Mr. German and Mr. Hogeboom, be a committee on the part of this house."¹⁰

In Senate, February 5, 1808.

"*Resolved*, That the senate do concur with the honorable the assembly in their preceding resolution; and that Mr. Taylor, Mr. Nicholas and Mr. Ward, be of the said committee on the part of the senate."¹¹

¹⁰*Assembly Journal*, 1808, p. 58.

¹¹*Senate Journal*, 1808, p. 36.

In the Assembly on March 21, Mr. Gold made a favorable report for the joint committee, and offered a resolution directing the Surveyor-General to cause accurate surveys to be made of the routes between the Hudson river and Lake Erie, and maps to be prepared, which should be transmitted to the President of the United States. So firmly fixed was the idea of the Ontario route that the intention of the original resolution was disregarded, the members of the joint committee not being willing to sanction so insane a project, but substituting a joint resolution which directed a survey of the rivers and streams along the usual route and such other route as the Surveyor-General might deem proper.

Six hundred dollars was appropriated for the expense of the survey and James Geddes was appointed by the Surveyor-General to make it. The Surveyor-General was likewise intent upon the Ontario route, for he directed Mr. Geddes to devote his time chiefly to investigations along this route, saying that, although it would be desirable to have a level taken throughout the whole distance of the interior route, the money would probably be so nearly expended that simply a view of the ground, with such information as could be obtained from others, would be all to be required, and that the survey of this route must be left to be undertaken later, if the Government should deem it necessary.

According to instructions, Mr. Geddes made surveys along several routes; one being from Oneida lake directly across to Lake Ontario, by way of Salmon creek; another from Oneida lake to Lake Ontario by following the valley of the Oswego river, but on the west side of the river. A third survey extended from Lake Erie to Lake Ontario around Niagara falls. An exploration was also made for an interior route or one not passing through Lake Ontario. As the money available was nearly exhausted, this last survey was little more than an inspection of the territory. The Surveyor-General had also entered into correspondence with Mr. Joseph Ellicott, the Holland Land Company's agent, from whom he had received valuable information concerning the western country, which satisfied him that a canal was practicable from the Niagara to the Genesee river by following the valley of the Tonawanda to its summit and descending thence to the east. In December, 1808, Mr. Geddes

had made a further exploration for which the Legislature afterward allowed seventy-three dollars in addition to the six hundred. He made his report, accompanied by maps and descriptions, to the Surveyor-General, on January 20, 1809.

As the surveys along the Ontario route are noticed in the history of the Oswego canal, and as the line around Niagara was never utilized, we are now concerned with nothing but the survey for the overland route. The money and the summer had gone in examining the territory between Oneida lake and Lake Ontario, Lake Erie and Lake Ontario, and Mud creek and Sodus bay, but the point of greatest difficulty and uncertainty, the tract between Genesee river and Mud creek (the western head waters of the streams entering Lake Ontario at Oswego), was still unexplored. All knowledge of the interior route was incomplete, but this territory remained unknown. It was supposed that there was high land between these two localities, and no source of water to supply a canal at this point was known. It was therefore due to Mr. Geddes' survey, of December, that the practicability of an interior canal was shown. Near Palmyra Mr. Geddes discovered a singular brook which divided, part running to Oswego and part to Irondequoit bay. Leveling from this point he discovered that it was about thirty-six feet lower than the Genesee river above the falls, with no high land between. But the problem was not solved, for the Irondequoit valley must be crossed. After leveling farther up the valley, he found a series of natural ridges, along the tops of which the canal was eventually conducted. In describing them Mr. Geddes said:

"The passage of the Irondequoit valley is on a surface not surpassed, perhaps in the world, for singularity. . . . Those ridges along the top of which the canal is carried, are in many places of just sufficient height and width for its support, and for seventy-five chains the canal is held up, in part by them, and in part by artificial ridges, between forty and fifty feet above the general surface of the earth; the sides of them are in most places remarkably steep, so that when the work is finished, the appearance to a stranger will be, that nearly all those natural embankments were artificial works."¹²

¹²Letter to William Darby. *Canal Laws*, Vol. I., p. 43.

These discoveries established the practicability of a canal without upward lockage from the Genesee river to Cayuga lake. Between the Genesee and Lake Erie no survey was made, but dependence was placed upon Mr. Ellicott's description and map. Mr. Geddes foresaw the difficulties that might arise in using the channels of the Tonawanda and Black creeks and Genesee river, and suggested what proved to be the final solution. In his report of January 20, 1809, he says:

"It would be important to know whether there is not some place in the ridge that bounds the Tonnewanta valley on the north, as low as the level of Lake Erie, where a canal might be led across, and conducted onward, without increasing the lockage by rising to the summit of the Tonnewanta swamp."¹³

Although the public mind was for some time tenacious of the Ontario route, it is worthy of note that this was the last survey along that line, till the agitation for a lateral canal to Oswego was begun.

As was expected, the transmission of this report to the President brought no response, but Judge Forman, being in New York on business in January, 1809, made a journey to Washington to see Mr. Jefferson and to explain that, in view of his proposal to expend the surplus revenues on roads and canals, New York had explored the route for a canal from the Hudson to Lake Erie, finding the project practicable beyond the most sanguine expectations. After the Judge had recounted the benefits that would accrue to the nation, the President replied that the undertaking, though desirable, was a century too soon, saying: "Why sir, here is a canal of a few miles, projected by General Washington, which, if completed, would render this a fine commercial city, which has languished for many years because the small sum of \$200,000 necessary to complete it, can not be obtained from the general government, the state government, or from individuals—and you talk of making a canal of 350 miles through the wilderness—it is little short of madness to think of it at this day."¹⁴

Here the matter rested till March, 1810. Mr. Thomas Eddy tells us that, being in Albany at that time, it occurred to him

¹³*Canal Laws*, Vol. I., p. 32.

¹⁴*Hosack's Memoir of De Witt Clinton*, p. 347.

that he might induce the Legislature to appoint a commission to explore the western country for the purpose of extending navigation from Oneida lake to Seneca lake. Having the interests of the Western Inland Lock Navigation Company in mind, his intention was to obtain authority for that company to build the canal, if the commission should report favorably. On the evening of March 12, he called on Jonas Platt, a member of the Senate, and proposed his idea. Mr. Platt suggested that the scheme should be extended so as to include the connection of Lake Erie with the Hudson, and unfolded a plan of instituting a board of commissioners to examine the whole route from the Hudson to both Lake Ontario and Lake Erie, with the view of making an independent canal, using the rivers as feeders only. As the old canal company had not fulfilled public expectation, he deemed it unadvisable to associate its name with the proposed measure. In reply Eddy said that the Legislature would be frightened to such a degree by the magnitude of the proposal that nothing would be granted. To this Platt answered that he thought that the greater project might be carried if De Witt Clinton would lend his aid and influence, and they both agreed that if Clinton should oppose the measure, it would be lost. Clinton then possessed a powerful influence over the dominant party in the state and Platt was leader of the minority in the Senate. After discussing the subject nearly all night, it was agreed that Platt should draw up a resolution, and should see Clinton and assure him that there was no political object in the application, and suggest that Clinton should introduce the resolution. Accordingly the next morning, after designating as commissioners such men as would balance opposing political parties and combine talents, influence and wealth, they met Mr. Clinton at the Senate chamber, and handed him the draft of the resolution, proposing that he should introduce it. Clinton listened to the exposition of their plan with much interest and consented to second the measure in blank (without names of commissioners), saying that although he had given but little attention to canal navigation, the subject appealed to him. When the Senate formed, Mr. Platt offered the resolution, which was seconded by Mr. Clinton, and passed unanimously. The next day the names of commissioners were inserted, and the resolu-

tion was sent to the Assembly, where, under the guidance of Stephen Van Rensselaer and Abraham Van Vechten, it received the unanimous concurrence of that house on the same day. The resolution appointed Gouverneur Morris, Stephen Van Rensselaer, De Witt Clinton, Simeon De Witt, William North, Thomas Eddy and Peter B. Porter as "commissioners for exploring the whole route, examining the present condition of the said navigation, and considering what further improvement ought to be made therein." Three thousand dollars was appropriated for the expense of the investigation.

Says Judge Platt: "From that period Mr. Clinton devoted the best powers of his vigorous and capacious mind to this subject; and he appeared to grasp and realize it, as an object of the highest public utility, and worthy of his noblest ambition."¹⁸

The unanimity with which this resolution was passed indicates the change of public sentiment and the quickened spirit for internal improvements which was abroad throughout the whole land. If this spirit were attributable to any one cause, it might be traced to President Jefferson's suggestions, but more probably it was due to a general awakening. To it may be ascribed in New York State, besides the essays of Hawley and the report of Geddes, the writings of Dr. Hugh Williamson, and in the country at large, the excellent report of Mr. Albert Gallatin, Secretary of the Treasury, the bill introduced in the United States Senate by Mr. Pope, and the resolution presented in the House of Representatives by Mr. Porter.

Mr. Gallatin's report, presented to Congress on April 4, 1808, had been the result of a Senate resolution of March 2, 1807. It contained valuable information concerning internal navigation, the route recommended in New York, however, being through Lake Ontario and around Niagara falls. Mr. Gallatin estimated the cost of water communications between the Hudson and Lake Champlain at eight hundred thousand dollars, between the Hudson and Lake Ontario at two million, two hundred thousand, and at the falls of Niagara for sloop navigation at one million dollars. However, he did not believe that sloop navigation to Lake Ontario could be effected for less than five million dollars.

¹⁸Hosack's *Memoir of De Witt Clinton*, p. 384.

Benjamin Wright had supplied "a map and general plan of the country from Albany to Oswego, on Lake Ontario, showing the topography and connection of the waters, and remarks and observations thereon, . . . by request of George Huntington, Esq. to whom Mr. Gallatin applied in 1807 for information."¹⁶

Early in 1810, Mr. Pope, a Senator from Kentucky, introduced a bill for facilitating communication by opening canals between different parts of the country. Among the many projects contemplated by the bill, there were three in New York,—the union of the Hudson with Lakes Erie and Ontario, a canal to pass the cataract of Niagara and a channel between the Hudson and Lake Champlain. For the whole scheme a tract of about ten million acres in Michigan was to be appropriated. The bill, however, was never acted upon.

This bill having failed of attention, Mr. Peter B. Porter, of New York, presented to the House of Representatives on February 8, 1810, a resolution to appoint a committee to examine into the expediency of appropriating public lands for the opening of roads and canals. Mr. Porter accompanied his resolution with an able speech, widely published in the journals of the day, in which he took a broad view of the subject, reciting the needs, the feasibility, the results and the ease of providing funds. A committee of twenty, with Mr. Porter as chairman, was thus appointed and on the twenty-third of the same month reported a bill "for the improvement of the United States by roads and canals," one of the provisions being for "opening canals from the Hudson to Lake Ontario, and around the Falls of Niagara." This bill also proved unsuccessful.

Although no immediately tangible results followed these measures, the effect was soon felt, especially in New York. Colden tells us that "The Legislature had before them, at that Session [1810], memorials from many citizens in different parts of the State, representing that Canada was attracting the greatest part

¹⁶Hosack's *Memoir of De Witt Clinton*, p. 504. Note: The report of Mr. Gallatin, accompanied by communications from Benjamin H. Latrobe and Robert Fulton, was a most valuable contribution to the literature concerning internal improvements at that time. It was published under the title, *Report of the Secretary of the Treasury on the Subject of Public Roads and Canals*, annexed to an anonymous compilation, entitled *A Treatise on Internal Navigation*. (Ballston Spa., 1817.)

of our internal commerce, in consequence of the facilities which were afforded by water communications, to transport commodities to her markets."¹⁷

During the summer of 1810 the canal commissioners made a journey of exploration across the state. Two of their number, Morris and Van Rensselaer, went by land, the others by boat up the Mohawk to Rome and thence down to Oswego, and up from Three River Point to Geneva, where the boats were sold, the party proceeding by carriage to the Niagara. Mr. Clinton kept a private journal¹⁸ of this tour, which gives an accurate view of the country at that time, a description of the works of the old canal company, and many interesting bits of local history. West of Utica the commissioners were accompanied by James Geddes, who had been employed by the Surveyor-General as their surveyor, and to show them the route he had reported in favor of. The commissioners took with them the report and maps of Geddes' former survey, Ellicott's letter and map of the country between the Niagara and Genesee rivers, and Jesse Hawley's essays. In 1809, General Micah Brooks, a member of Assembly from Ontario county, had borrowed the essays from Mr. Hawley and had taken them to Albany. Nothing was done concerning canals at that session of the Legislature, and he had left them with the Surveyor-General, to investigate the subject. When the return trip was begun by the commissioners, they left Mr. Geddes "to take levels and distances on a variety of points,"¹⁹ as directed by them.

His first survey was to determine whether some depression existed in the territory north of Tonawanda creek, through which

it might be led without too excessive cutting. He was successful in locating the place where the canal was eventually built, although the southern route was twice surveyed in after years, and continued to receive consideration up to the time of beginning work on the western division of the canals.

As the public was deeply interested in the project, the commissioners deemed it wise to make a report without waiting for extended surveys and on March 2, 1811, this report was presented

¹⁷Colden's *Memoir*, p. 34.

¹⁸Published in full in Campbell's *Life and Writings of De Witt Clinton*, pp. 27-204. (New York, 1849.)

¹⁹*Id.* p. 132.

to the Senate. The commissioners were opposed to the route through Lake Ontario, lest traffic should be diverted to Montreal. The report gives a good description of the topography of the state, and the need and practicability of the canal are shown, but the form of canal proposed—an inclined plane which was to have a uniform slope from Lake Erie to the ridge between Schenectady and Albany and thence to descend to the Hudson by locks—was an unfortunate suggestion and one that was disappointing to sensible men throughout the Union. By this scheme the canal was to be carried over the mouth of Cayuga lake on an embankment one mile long and one hundred and thirty feet high and at Schoharie creek on an embankment one hundred and fifty feet above the surface. The estimated cost was five million dollars.

Of this report De Witt Clinton says: "If the board had confined their report to its natural and appropriate objects—the practicability and expense of the Erie canal—much ridicule would have been averted, and many prejudices prevented. But they had unfortunately committed the preparation of their draft to their president, Mr. Morris, a man of elevated genius, but too much under the influence of a sublimated imagination. Conceiving the sublime idea of creating an *artificial river* from the elevation of Lake Erie to the Hudson, he digressed into a long exposition of the facilities and advantages of an *inclined plane canal*, wherein he passed over rivers and lakes by aqueducts, and valleys by mounds, in order to maintain his descent. When the board assembled to consider the draft, they, from motives of delicacy, did not insist upon striking out this part of the report, especially as it was hypothetical from its very nature, and a mere gratuitous suggestion."²⁰

Mr. Clinton has been severely criticised for writing thus of his deceased friend and for not being willing to assume responsibility for the defects as well as for the success of the enterprise. This form of canal was approved by William Weston, the English engineer, to whom the profile was sent for inspection, and a modified form of this plan was incorporated in the report of the commissioners in the following year.

²⁰*The Canal Policy of the State of New York*, by Tacitus (De Witt Clinton), p. 24.

The commissioners deprecated further attempt to canalize the natural streams. In beginning their report, "they beg leave to observe, on the present navigation of the Mohawk river, Wood creek, Oneida lake, and the Oswego river, . . . that experience has long since exploded in Europe the idea of using the beds of rivers for internal navigation."²¹

A letter written from London, August 22, 1772, by Benjamin Franklin to S. Rhoads, Mayor of Philadelphia, is pertinent here. He says: " . . . here they look on the constant Practicability of a Navigation allowing Boats to pass and repass at all Times and Seasons, without Hindrance, to be a point of the greatest Importance, and, therefore, they seldom or ever use a River where it can be avoided. . . . Rivers are ungovernable things, especially in Hilly Countries. Canals are quiet and very manageable. Therefore they are often carried on here by the Sides of Rivers, only on Ground above the Reach of Floods, no other Use being made of the Rivers than to supply occasionally the waste of water in the Canals."²²

Perhaps the most valuable suggestion of this report was the protest against making any grants to private persons or companies, lest the contemplated object of cheap transportation should be defeated. Whether the canal should be built at the expense of the State or the Union, say the commissioners, must be left to the wisdom, justice and munificence of the National Legislature.

On April 8, 1811, was passed the act which created a board of "commissioners for the consideration of all matters relating to the said inland navigation." The same men, who had been appointed by the resolution of the preceding year, were made members of this board, together with Robert R. Livingston and Robert Fulton.

The commissioners were empowered to make application in behalf of the State to Congress or to the Legislature of any State or Territory to co-operate and aid in the undertaking, and also to the proprietors of the land, through which the contemplated canal would pass, for cessions or grants. They were also author-

²¹*Senate Journal*, 1811, p. 65.

²²*Development of Transportation Systems in the United States*, by J. L. Pingwalt, pp. 41-42. (Philadelphia, 1888.)

ized to ascertain whether advantageous loans could be procured on the credit of the State, and on what terms the Western Inland Lock Navigation Company would surrender their rights and interests to the people of the State and to employ engineers and surveyors, \$15,000 being appropriated to defray any expenses.

On March 14, 1812, the commissioners made a report to the Senate of their labors. Of their endeavors to obtain the aid of the United States Government they reported that in addition to letters addressed to President Madison and to Congress, two commissioners, Gouverneur Morris and De Witt Clinton, were deputed to convey these messages to Washington and to urge the co-operation of the general Government in promoting the interests of internal navigation. After reaching Washington, the commissioners found that a feeling of jealousy against New York existed among the members in Congress, and they deemed it wise not to ask for an appropriation of money, and to include other States in the benefits to be given. They succeeded in interesting the President sufficiently to induce him to send a message commending the consideration of the subject to Congress. That body referred the matter to a large committee, and a bill was drafted which proposed the grant of lands in the Territories of Michigan and Indiana to several of the States to aid them in building canals. The proposed grants of land were to be redeemed by the General Government after the canal was completed, and in consideration of this aid, no tolls were to be charged above the amount needful to pay the annual expense of superintending and keeping the canal in repair. The committee, after considerable delay, decided to report the bill favorably, but later for some unknown reason reversed its decision.

Of the States and Territories appealed to for aid, nine returned answers, New Jersey, Connecticut and Vermont declining to assist in any way; Michigan answering that a route around Niagara falls and by way of Oswego should be adopted instead of the inland route from Lake Erie; and Tennessee, Massachusetts, and Ohio saying that their Representatives in Congress had been instructed to favor a proposition for material aid.

The commissioners further reported that notwithstanding the scarcity of money consequent on the war which had so long raged in Europe, they had ascertained that a loan of five million dollars

could be obtained there, on the credit of the State, for a term of ten or fifteen years at an annual interest of six per cent. The directors of the Western Inland Lock Navigation Company asked one hundred and ninety thousand dollars for the shares held by them, exclusive of the three hundred and fifty shares held by the State. This demand was deemed exorbitant.

After having had another year in which to consider the subject, the commissioners were still of the opinion, expressed in their former report, that the canal could be built for five million dollars, but lest they should be mistaken they placed their estimate in this report at six millions, although they admitted that they lacked the needful information and the professional ability to make a careful estimate.

The plan of an inclined plane from Lake Erie to the Hudson was abandoned, and in its place was submitted the scheme of an inclined plane from Lake Erie to Seneca outlet, a descent by locks to a level suitable for crossing Cayuga outlet, this level being carried to a point where ascent by locks into the Rome level was needful; this level in turn was to be carried to a point convenient for beginning another inclined plane to a basin near the Hudson river.

The commissioners' report of the previous year, together with Geddes' map and profile, had been sent to Mr. William Weston, the eminent English engineer who had superintended the affairs of the Western Company. The commissioners quote from his reply, in which he approves of the interior route, and also of the inclined plane for the western section. However, during the season of 1811, the commissioners had caused surveys to be made between Seneca and Cayuga lakes and from Rome to Waterford, which had shown that an inclined plane throughout the entire length was impracticable. Benjamin Wright had been engaged to make the survey on the north side of the Mohawk between Rome and Waterford.

The commissioners had now in their employ two men, Geddes and Wright, who were destined to become the pioneers of a new profession in America. Their abilities were not at first recognized, and the commissioners continued to call them surveyors and to advise the summoning of a capable engineer from England. It is said that out of deference to Mr. Morris' views much

surveying had been done to determine a location suitable for an inclined plane. But with the passing of his influence had gone this form of canal, and also the idea that a foreign engineer must have the direction of the location and construction of the canals.

The report strongly urged the immediate beginning of the work, pointing out that it was absurd to suppose that an expenditure of six million dollars, in ten years, by a population of one million people, would impose a grievous burden on any, and declaring that the needs were such as to demand a canal and that to delay would result in nothing but loss to the State.

In consequence of the failure to obtain Federal aid the commissioners advised an early beginning by New York State alone, saying: "The maxims of policy . . . seem imperatively to demand that the canal be made by her [the State], and for her own account, as soon as circumstances will permit. . . . Whether this subject be considered with a view to commerce and finance, or on the more extensive scale of policy, there would be a want of wisdom, and almost of piety, not to employ for public advantage those means which Divine Providence has placed so completely within our power."²³

At the request of the commissioners, Jonas Platt introduced a bill in the Senate at the extra session of June, 1812, which passed each House by a small majority. On June 19, 1812, this became a law. It authorized the commissioners previously appointed to purchase the rights of the Western Inland Lock Navigation Company, but the purchase was to be conditional and only to become absolute when the commissioners should have satisfactory information from some experienced engineer, by actual examination, that the accomplishment of the contemplated canal would be practicable, and when they should be authorized by an act of the Legislature to commence their operations for opening the canal. The commissioners were also directed to procure any voluntary cessions or grants of any lands by persons or corporate bodies, who might be inclined to make the same, and to negotiate a loan of five million dollars on the credit of the State, and to invest this in stock or other funds till needed for the work of construction.

²³*Senate Journal*, 1812, pp. 112-113.

During the season of 1812 Benjamin Wright made two important surveys. One extended from Rome to Seneca lake in an endeavor to locate a canal with a uniform level between those places. The alignment proved to be so crooked and the distance so increased that the plan was abandoned. The other survey was along the south side of the Mohawk between Rome and Albany, with especial attention to the pine plains between Schenectady and Albany, which were searched in vain for any route other than along the side of the Mohawk. The report of these explorations, with maps and profiles, seem to have been lost, as Mr. Wright said that he had never been able to find them after they were submitted.

The war between the United States and England turned the thoughts of the people from canal projects and interfered with any active operations. The commissioners made no report of their labors till March 8, 1814, and then they had made but little progress. They say that they had secured an English engineer to make the necessary investigations, but he had not yet arrived in America. On account of the war the attempt to obtain a loan had failed, but several large grants of land had been secured. The remainder of the report is devoted to ridiculing those who advocated the route by Lake Ontario.

While all energy was being engaged by the war, it was not deemed wise to attempt any vigorous canal agitation. On April 15, 1814, the Legislature passed an act repealing the clauses of a former act which provided for the borrowing of money, even a proposed amendment to supply funds for paying the English engineer being lost. Although this act has been characterized by De Witt Clinton as the culmination of a long threatened storm of opposition which stripped the commissioners of all substantial power and resolved them into a mere board of consideration, it seems to have been simply the part of wisdom to adopt such a measure, for the act was carried by a large majority in the Assembly and in the Senate without a dissenting voice.

Although the war interrupted the progress of the canal movement, the effect of this struggle was eventually in favor of the enterprise. The passage of troops through the western wilderness brought to light vast fields for development, and the need of improved facilities for transportation to bring about that

development. Another fact which the war emphasized above all else was the necessity for providing a better means for conveying the munitions of war. It is said that a piece of ordnance worth four hundred dollars at the foundry had cost the Government two thousand dollars when delivered on the frontier, and that a barrel of pork had cost one hundred and twenty-six dollars. The hardships and disastrous delays, caused by the breaking down of wagons and the wearing out of horses, were potent arguments in favor of canals. The debts that the Nation had incurred for the mere transportation of war materials would have gone far toward constructing a canal.

During the latter part of 1815 the friends of the canal resolved upon another attempt to revive interest in the project. The country was still suffering from the effects of the recent war, and by many citizens grave doubts were entertained of the practicability of the undertaking and of the sufficiency of the State's resources to secure its completion. The measure was also opposed on party grounds. The same men, Eddy, Platt and Clinton, who had secured the appointment of the first commissioners in 1810, now took the initiative in arousing public sentiment.

In the autumn of 1815, Judge Jonas Platt was holding court in New York, and Thomas Eddy, having invited him to breakfast one morning, proposed to him the plan of endeavoring to get up a public meeting, in order to urge the propriety of offering a memorial to the Legislature, importuning them to construct the canal from Lake Erie to the Hudson. Judge Platt readily agreed and consented to present the subject to the meeting. Eddy called on De Witt Clinton, then Mayor of New York, who heartily joined in the undertaking. It was agreed that cards of invitation should be sent to about a hundred prominent men of the city. The large and respectable assemblage which gathered at the City Hotel, on December 3, was presided over by William Bayard and addressed by Judge Platt, De Witt Clinton, John Swartwout and others. In his introductory speech Judge Platt urged the expediency of a formal and public abandonment of the plan of an inclined-plane canal which had been proposed in the first report of the commissioners. Clinton, Swartwout, Eddy and Cadwallader D. Colden were appointed a committee to pre-

pare a memorial to the Legislature. This able document, known in canal history as the "New York Memorial," was written by Clinton, and from its presentation may be dated the earnest and active progress of the enterprise. ". . . this memorial," says one writer, "was the foundation of the present system of internal navigation; . . . it effectually exploded the Ontario route, and silenced forever its advocates; and . . . it produced an electrical effect throughout the whole country."²⁴ It was signed by a great portion of the respectable citizens of New York City, and copies sent throughout the state aroused an enthusiasm which resulted in public meetings in almost every city and village between Albany and Buffalo, and in the adoption of similar memorials. This agitation brought before the next Legislature an appeal from more than one hundred thousand petitioners to proceed at once with the work of making a canal. The project immediately became popular. This memorial with its clear and concise style of expression, its forceful arguments, and its large amount of information concerning the whole subject appealed to the multitudes who read it, and turned many of the skeptical to its favor. On the other hand it awakened an opposition which asserted itself when the measure was being debated at the next session of the Legislature, a powerful opposition, which arose from rival interests, both individual and sectional, from political differences, from personal hostility and also from the honest doubts and fears of prudent men. The leaders of the enterprise were still the subjects of ridicule throughout the land.

Governor Tompkins in his speech delivered at the opening of the Legislature on February 2, 1816, said:

"It will rest with the Legislature, whether the prospect of connecting the waters of the Hudson with those of the western lakes and of Champlain, is not sufficiently important to demand the appropriation of some part of the revenues of the state to its accomplishments, without imposing too great a burden upon our constituents. The first route being an object common with the states of the west, we may rely on their zealous co-operation in any judicious plan that can perfect the water communication in that direction. As it relates to the connecting the waters

²⁴*The Canal Policy*, p. 28.

of the Hudson with those of Lake Champlain, we may with equal confidence count on the spirited exertions of the patriotic and enterprising state of Vermont."²⁵

De Witt Clinton charged that at heart, Governor Tompkins was an opponent to the canals and that these utterances were made merely for political effect, and were prompted by the large number of mass meetings being held throughout the state. However, a host of petitions, nominally in answer to this speech, were sent from all parts of the state to the Legislature of 1816. The most important of these was the memorial from New York, which has just been mentioned.

On March 8, 1816, the board of canal commissioners, which had been created by the act of April 8, 1811, made its final report to the Legislature. Deprived of funds by the Legislature of 1814, the commissioners had accomplished nothing, but they still urged the immediate commencement of operations on the canal from Lake Erie to the Hudson, and also on a route to Lake Champlain, and recommended employing American engineers. They made their last appeal in the following words: "From the number and respectability of the applications now before the legislature in favor of an immediate commencement and vigorous prosecution of this great national work, it is evident that the immense advantages which would result from its completion are duly appreciated by our fellow-citizens; and it only remains for the legislature to sanction by their approval an undertaking which combines in one object the honor, interest, and political eminence of the state."²⁶

Mr. Morris did not sign this report. He drafted a report which the other commissioners desired to amend, but upon his refusal to make the changes, another report was drafted by the other commissioners and was presented without Morris' signature.

A favorable report from a joint committee of the Senate and Assembly was rendered and after many debates and amendments, a bill (chapter 237) was passed on April 17, 1816, which appointed Stephen Van Rensselaer, De Witt Clinton, Samuel Young, Joseph Ellicott and Myron Holley as "commissioners, to consider, devise, and adopt such measures as may or shall be

²⁵*Assembly Journal*, 1816, p. 12.

²⁶*Assembly Journal*, 1816, p. 269.

requisite, to facilitate and effect the communication, by means of canals and locks, between the navigable waters of Hudson's river and lake Erie, and the said navigable waters and lake Champlain." The commissioners were directed to cause the necessary surveys, plans and estimates to be made, and were given twenty thousand dollars for expenses. They were also instructed to ascertain whether loans of money could be procured, and to apply for donations of land or money to the United States, to interested States and to corporate bodies and individuals.

When this bill passed the Assembly it had provided for the beginning of work between Rome and the Seneca river and between the Hudson and Lake Champlain, and had contained the names of thirteen prominent men as commissioners, but when it was considered in the Senate it was so amended, on motion of Martin Van Buren, as to strike out all clauses authorizing construction, and eight names were stricken from the list of commissioners. The bill had met with strong opposition throughout its course in the Assembly. An amendment for a local tax on lands lying within twenty-five miles of the canal had allayed some opposition, but this amendment, together with all else directing the work of construction, was stricken out by the Senate, on the ground that more accurate knowledge was required before a law authorizing the work could be justified. When the bill was returned, the Assembly refused to concur in the amendments and the Senate in turn refused to recede. The friends of the measure despaired of its passage. It was the last day of the session, and time was pressing. These advocates thought that simply to order another survey was useless, but finally, lest all should be lost, through the strenuous efforts of a few of its friends, the Assembly was induced to reconsider its vote of non-concurrence, and the measure passed in the form in which it came from the Senate. This act really marked the beginning of the active canal policy which resulted in the passage of an act during the following year, which authorized the construction of the canal.

The commissioners met in New York on May 17, 1816, and appointed De Witt Clinton as president, Samuel Young as sec-

retary and Myron Holley as treasurer. The Erie canal was divided into three great sections, and an engineer assigned to each. The western section, extending from Lake Erie along the north side of the mountain ridge to the Seneca river, was assigned to James Geddes; the middle section, from the Seneca river to Rome, to Benjamin Wright; and the eastern section, from Rome to the Hudson, to Charles C. Broadhead. In the course of their investigations, the commissioners "found it expedient to appoint a fourth engineer, to explore and survey the country from Buffalo to the east line of the Holland patent purchase, on the south side of the mountain ridge, it being represented that this route might be preferable to that on the north side,"²⁷ and William Peacock was the engineer assigned to that work. The surveys of the Champlain canal were under the direction of Colonel G. Lewis Garin, as engineer.

For years the commissioners had been endeavoring to persuade Mr. William Weston to again come to America and take charge, as engineer, of canal affairs, offering him a salary of seven thousand dollars a year. Upon his final refusal the commissioners were much perplexed as to what course they should pursue. As is told more fully in the chapter treating of the canals as a school of engineering, Geddes and Wright came to the commissioners at this juncture, and expressed their confidence in their ability to locate and construct the canal, but desired that the commissioners should feel a like confidence. This confidence the commissioners gave, but with much censure from the enemies of the canal till the engineers had proved their ability.

On November 5, 1816, at an extra session of the Legislature for appointing presidential electors, Governor Tompkins, in his speech, alluded to the subject of canals in what has been called a "negative paragraph." He said: "It is respectfully submitted to your wisdom to make provision at the present session, for employing a part at least of the state prisoners, either in building the new prison at Auburn, erecting fortifications, opening and repairing great roads, constructing canals, or in making other improvements."²⁸

²⁷*Assembly Journal*, 1816-1817, p. 313.

²⁸*Id.* p. 8.

At a time when people had been aroused on the subject, this brief reference to the canals was interpreted to mean a hostility on the Governor's part which he later plainly demonstrated. However, it is only fair to Governor Tompkins to remember that the Legislature was convened at this time in its short session, chiefly to appoint electors and not to consider all measures of general welfare.

During the year 1816 the surveys and estimates were so far completed as to allow the commissioners to make a report to the Legislature on the Erie canal on February 17, 1817, and on the Champlain on the eighteenth of the following March. The commissioners had given their personal attention to the work of exploration, and had superintended the operations of the engineers. Before beginning the surveys, two of the commissioners and two of the engineers had visited the Middlesex canal, in Massachusetts, in order to obtain practical information on the subject. In their report on the Erie canal, the commissioners state that in their opinion the dimensions of the canal should be as follows: "width on the water surface, forty feet, at the bottom, twenty-eight feet, and depth of water, four feet, the length of a lock, ninety feet, and its width, twelve feet, in the clear." They say that "vessels carrying one hundred tons, may navigate a canal of this size; and all the lumber produced in the country, and required for market, may be transported upon it."²⁹ The report consists of a long and detailed account of the plans and of the estimated cost of construction, most of the report being made from the several engineers' reports, giving the results of the surveys and the estimates, mile by mile. During the early period the commissioners' reports were largely derived from the engineers' reports, not under the name of the engineers, however, but under the more imposing title of the commissioners.

The estimates were made from actual surveys of the country between Lake Erie and Schoharie creek, but from that point to the Hudson recourse was had to former investigations. The commissioners were unable to obtain a sixth engineer to undertake this portion, and the five men employed had not had time to do the work. As William Weston, the English engineer, who had

²⁹*Assembly Journal*, 1816-1817, p. 313.

been employed in 1795 by the directors of the Western Navigation Company, had investigated this territory, and as Benjamin Wright had twice leveled over the same location, the information gathered by these men was taken as a basis for the estimate. Much pains had been taken to collect all the facts which might affect the estimated cost. Test pits had been excavated to ascertain the nature of the soil. The results of the surveys are found in the following:—

“RECAPITULATION.

OF EXPENCES.

“From Lake Erie to a point 11 miles up the Tonnewanta,	\$250,877
Tonnewanta to the Seneca river,	1,550,985
Seneca river to Rome,	853,186
Rome to Schoharie creek,	1,090,603
Schoharie creek to Albany,	1,106,087
Add for general expenses,	75,000
	<hr/>
In the aggregate,	\$4,881,738
But, if the route south of the mountain ridge in the country west of the Genesee river, is adopted, in preference to the northern route, then deducting,	309,925
	<hr/>
The aggregate of expense will be	\$4,571,813

OF DISTANCES.

	Miles.	Chains.
From Lake Erie to the point up the Tonnewanta,	27	
Tonnewanta to Seneca river,	136	2½
Seneca river to Rome,	77	
Rome to Schoharie creek,	71	27
Schoharie creek to Albany,	42	
	<hr/>	<hr/>
The aggregate distance is	353	29½

OF RISE AND FALL.

From Lake Erie to Seneca river, a fall of	194	ft. by 25 locks
Seneca river to Rome, a rise of	48.50	6
Rome to Schoharie creek, a fall of	132.85	16
Schoharie creek to Albany, a fall of	126	30
	<hr/>	

The aggregate of rise and fall, in feet is 661.35 by 77 locks.

"Lake Erie is 564.85 feet higher than the Hudson, and 145½ feet higher than Rome.

"The average expense, per mile, of this canal, according to the foregoing estimates, taking the north route beyond the Genesee river, is little more than \$13,800." ⁸⁰

The estimated cost of the Champlain canal was \$871,000 and the dimensions adopted were "thirty feet wide at the surface, twenty feet at the bottom, and three feet deep, and the locks to be seventy-five feet long and ten feet wide in the clear."

The survey of the route on the south side of the mountain ridge, from Buffalo to the east line of the Holland Company's land was made by William Peacock under the superintendence of Joseph Ellicott, one of the canal commissioners. Mr. Ellicott was the sub-agent of the Holland Company, and was the advocate of this route, having sent the information in 1808, which satisfied the Surveyor-General that a canal was practicable along this line between the Niagara and the Genesee. As the company had made a large grant of land for canal purposes, it was deemed advisable to investigate this route, which extended for a distance of forty miles through the company's land. The survey showed that an elevation of seventy-four feet would have to be overcome and a supply of water provided from the streams along the route. However, the northern route, notwithstanding its saving of one hundred and forty-eight feet of lockage, and its supply of water directly from Lake Erie, seemed to stagger the canal commissioners and the engineers, on account of its heavy rock cutting at Lockport, and the southern route continued to be considered until the time of final decision just prior to the beginning of construction work.

⁸⁰ *Assembly Journal*, 1816-1817, pp. 353-354.

The commissioners had not ascertained whether a loan could be obtained in Europe, but had begun negotiations for one. They had received some grants of land, the largest being from the Holland Land Company, which offered two tracts of its land in Cattaraugus county, containing upwards of one hundred thousand acres.

The commissioners close their report with these words: "Their investigations have shewn the physical facility of this great internal communication, and a little attention to the resources of the state will demonstrate its financial practicability. And they may be permitted to remark, that unless it is established, the greater part of the trade, which does not descend the Mississippi, from all those vast fertile regions west of the Seneca lake, will be lost to the United States."²¹

The whole cost of making these surveys, plans, estimates and reports, together with the necessary expenses of the commissioners and compensation for their secretary and treasurer was only twenty-four thousand dollars.

In November, 1816, the president of the board of commissioners had sent communications to Congress and to the States of Ohio, Kentucky and Vermont, again soliciting aid or co-operation. Ohio alone had responded, offering such help as its resources should justify, after some decisive action should have been taken by New York State, and some plan of co-operation formulated. Again in January, 1817, he had written to Congress saying that the canal commissioners had seen, "with great pleasure, the outlines of a plan for appropriating a considerable fund to the internal improvement of the country," and suggesting that the distribution be made according to the ratio of population in each state. In that case New York would receive about \$85,000 or \$90,000 annually, and as the interests of Ohio and Vermont were identified with those of New York in the construction of the proposed canals, the sum would be increased to \$140,000, if their portions were added.

This communication to Congress was prompted by a bill which had been introduced and advocated in that body by John C. Calhoun, for apportioning among the several states, for constructing roads and canals, the dividends from stock owned by

²¹*Assembly Journal*, 1816-1817, p. 355.

the United States in the National Bank. Pending final action on this measure, it is probable that the commissioners had delayed presenting their report, and that the joint committee, to which it was referred, waited a while longer to learn whether National aid was to be given. This bill passed both Houses of Congress, but finally on the third of March, as one of the last acts of his public life, President Madison vetoed the measure on constitutional grounds. As this action of the President was not only directly opposed to the invariable practice of the National Government, but also the reverse of his policy in sanctioning very similar appropriations for other States, a general feeling of indignation was aroused in New York, which in the end proved friendly to canal interests. Many of the Legislators and also the people in general manifested a determination that the State should undertake the work alone.

During the year 1816 events had transpired which materially affected the canal project. Governor Tompkins had been elected to the Vice-presidency, and the gubernatorial chair would be vacant after the fourth of March. De Witt Clinton had adopted the canals as a party issue, and the plans to elect him to the office of Governor awoke many old hostilities, and his canal policy became in part a test of strength between the two opposing parties. However, the greater portion of early canal history is unusually divested of party spirit.

On March 18, 1817, the joint committee of the Senate and Assembly made a most favorable report recommending the immediate commencement of operations between Rome and the Seneca river and between Lake Champlain and the Hudson. It was deemed wise to undertake only a portion of the Erie canal at first, in order to prove whether estimates of cost were correct. In the event of no more being built, this section would open new and valuable communications, which would greatly benefit the community.

Mr. J. Rutzen Van Rensselaer, who had been influential in pushing legislation through the Assembly in 1816, although not a member this year, was in attendance at this session, and so confident was he of the ultimate success of the enterprise, that he made a proposition, which accompanied the report of the joint committee, to undertake the construction of the whole canal

himself, upon condition of receiving a certain portion of the tolls.

This report contained a plan of finance, which had been devised by the canal commissioners at the request of the joint committee, and was embodied in a bill which was introduced in the Assembly on March 19.

Then began a fierce struggle, which at times appeared hopeless for the canal project, till one by one the influential Legislators enlisted in the ranks of its friends. The bitter opposition which it encountered is surprising. The members from New York City were hostile, almost to a man. That they could have been so blind to the benefits which have so largely added to the greatness of their city, is indeed strange.

The bill as first introduced specified that the State should borrow money for prosecuting the work, and directed commissioners of this fund to prepare a suitable plan of finance and present it to the ensuing Legislature. This proposition was not favorably received, but in its place was substituted an able plan of finance which had been carefully worked out by George Tibbitts, a member of the joint committee and a Senator from Rensselaer county. This substitution of Tibbitts' plan was made by Wheeler Barnes, although the fact is not recorded in the *Assembly Journal*. This plan "was to establish a fund to be managed by commissioners, the income of which would raise money sufficient to complete the canals in twelve or fourteen years with seven millions of dollars, and leave a sinking fund sufficient to redeem the debt to be created, at a period not far distant from their completion."²² Thus it was that the State was indebted to Mr. Tibbitts' ability for a successful and durable plan of canal revenue. This scheme provided that the fund should be raised in such a manner that the greater amount should come from those most benefited. It was considered that the City of New York would be more than compensated for the loss of a part of the auction duties; that the West, where most of the salt was consumed, would pay a heavy tax upon that article; that the towns and counties along the line of the canal would consent to a small additional tax; that a portion of the wild

²²Letter from Wheeler Barnes, in Hosack's *Memoir of De Witt Clinton*, pp. 492-493.

lands might be devoted to this object; and that a steamboat passenger tax might be imposed. The plan also provided for borrowing money on the credit of this fund.

After much debate, the provision for levying an annual tax upon the real and personal estates, in the several cities, villages, towns and counties, immediately to be benefited by the canals, was voted down. It was seen that here was dangerous ground. There was a determined opposition to any form of local taxation, and it was evident that without some such provision the bill would fail. In lieu of this local taxation, a clause to tax lands within twenty-five miles of each side of the canal was inserted, and finally passed.

In the Assembly debates, Judge Pendleton, Wheeler Barnes and William B. Rochester came to the support of William A. Duer on the side of the measure, but after Elisha Williams, of Columbia, stepped out in its favor, with his extraordinary powers of eloquence and debate, the battle was won. In a masterly speech, just before the vote that indicated the final victory, "he appealed to the members from New-York. . . . He conjured them in the most animated and persuasive manner, not to forget that this was in fact an attempt of the people of the state to supply their favourite City, at the cheapest rate, with every production of the soil in abundance. . . . 'If,' said he, turning to a leading member of the New-York delegation, 'if the canal is to be a shower of gold, it will fall upon New-York; if a river of gold, it will flow into her lap.'"³³

When the measure was considered in the Senate, the most able speech in its favor was made by Martin Van Buren. This was his great speech of the session, and his espousal of the cause was a surprise to many, for he was known to be working to defeat Clinton's election as Governor. But he rose proudly above party limitations, saying that he had seen with regret that divisions had existed upon this subject, apparently arising from hostility to the commissioners. He declared that he should consider his vote for the measure the most important vote he ever gave in his life. At the close of the speech, Clinton, who had been an attentive listener, throwing aside the memory of their political collisions, warmly thanked Mr. Van Buren.

³³William L. Stone, in Hosack's *Memoir of De Witt Clinton*, p. 450.

An important amendment was made in the Senate upon Van Buren's motion. This allowed the borrowing of money on the credit of the State rather than on the credit of the canal fund. The granting of unappropriated lands was stricken out. Finally, on April 15, 1817, was passed this act which authorized the construction of the Erie and Champlain canals, all the members of Assembly and Senate from New York City voting against it.

But it had still to be approved by the Council of Revision, a body consisting of the Governor, the Chancellor, and the Judges of the Supreme Court, which held the power of veto now possessed by the Governor. In the Council of Revision this bill encountered determined opposition, which would have proved fatal, but for the accidental coming into the council chamber of an opponent of the canal, and the use, on his part, of an unfortunate argument against a measure already lost. The following is the narrative as given by Judge Platt, one of the members of the council:—

“Lientenant-Governor Tayler, as acting Governor, was then president of the council, and had ever been distinguished as one of the ablest and most formidable opponents of the canal. The other attending members of the board were Chancellor Kent, Chief Justice Thompson, Judge Yates and myself. After reading the bill, the president called on the chancellor for his opinion. Chancellor Kent said he had given very little attention to the subject; that it appeared to him like a gigantic project, which would require the wealth of the United States to accomplish it; that it had passed the Legislature by small majorities, after a desperate struggle; and he thought it inexpedient to commit the State, in such a vast undertaking, until public opinion could be better united in its favour.

“Chief Justice Thompson was next called on for his opinion. He said he cherished no hostility to the canal, . . . but, he said, the bill gave arbitrary powers to the commissioners over private rights, without those provisions and guards . . . required; and he was therefore opposed to the bill.

“Judge Yates was a decided friend of the canal, and voted for the bill. My heart and voice were ardently engaged in support of the measure, which now seemed at a fatal crisis.

"The president of the council panted with honest zeal to strangle the infant Hercules at its birth, by his casting vote in the negative. A warm and animated discussion arose; and afterwards a more temperate and deliberate examination of the bill and its provisions, obviated in some measure, the objections of the Chancellor and the Chief Justice. Near the close of the debate, Vice-President Tompkins came into the council chamber, and took his seat familiarly among us. He joined in the argument, which was informal and desultory. He expressed a decided opinion against the bill; and among other reasons, he stated, that the late peace with Great Britain was a mere truce; that we should undoubtedly soon have a renewed war with that country; and that instead of wasting the credit and resources of the State, in this chimerical project, we ought immediately to employ all the revenue and credit of the State, in providing arsenals, arming the militia, erecting fortifications, and preparing for war. 'Do you think so, sir?' said Chancellor Kent. 'Yes, sir,' was the reply; 'England will never forgive us for our victories on the land, and on the ocean and the lakes; and my word for it, we shall have another war with her within two years.' The Chancellor then rising from his seat, with great animation declared, 'if we must have war, or have a canal, I am in favour of the canal, and I vote for the bill.' His voice gave us the majority; and so the bill became a law.

"If that bill had been rejected by the council, it could not have been carried by two-thirds of the Senate and Assembly. . . . At no future period could the work have been accomplished at so small an expense of land, of water, and hydraulic privileges. Rival routes, and local interests, were daily increasing and combining against the project; and in my estimation it was one of the chief grounds of merit in the advocates of the Erie canal, that they seized on the very moment most proper and auspicious for that immortal work."²⁴

This act created a canal fund which was to be managed by a board denominated "the commissioners of the canal fund," consisting of the Lieutenant-Governor, the Comptroller, the Attorney-General, the Surveyor-General, the Secretary and the Treasurer. This board was authorized to borrow money on the credit of the

²⁴Jonas Platt's letter in Hosack's *Memoir of De Witt Clinton*, pp. 387-388.

State, to an amount which, together with the net income of the fund, should not exceed four hundred thousand dollars a year.

The canal fund was to be derived from a duty on all salt manufactured, from a tax on steamboat passengers, from the proceeds of lotteries and duties upon sales at auction after certain sums were deducted for other purposes, from the tolls on the canals, from grants and donations, and from a tax on lands lying within twenty-five miles of either side of the canals.

The commissioners appointed by the act of April 17, 1816, were continued in office, and were designated "canal commissioners." They were authorized to construct a canal between the Mohawk and Seneca rivers, and between Lake Champlain and the Hudson river at Fort Edward. The act also provided for the purchase of the rights of the Western Inland Lock Navigation Company, after the payment for such damages as were adjudged proper by appraisers to be appointed by the Supreme Court.

Early in the spring of 1817 operations were begun at Rome, by a careful reexamination of the previous year's surveys. Benjamin Wright was the engineer assigned to the Erie canal and James Geddes to the Champlain. It was found that a short summit level at Rome could be avoided, thus making a long summit level from Utica to Salina. Lest some error in taking the levels over this long distance should cause future trouble, a separate line of levels was run by the way of Oneida and Onondaga lakes, and closed with the first levels with an error of less than an inch and a half.

The law authorizing the canal directed that communications should be opened "between the Mohawk and Seneca rivers," without designating the point of junction with either stream. The commissioners, therefore, deeming themselves vested with discretionary power, decided to continue the canal to Utica. Inasmuch as the Mohawk between Rome and Utica was very winding, and so shallow that in time of low water it became a portage and as this river would have to serve as the channel for navigation after the completion of the middle section and before the eastern section could be built, the commissioners considered that public interests would best be served by extending the middle section as far east as Utica.

This part of the line, being in general less encumbered with forests and other obstructions, was the scene of the first operations. But the remainder of the middle section was through unopened territory. If we pause a moment to consider the condition of central and western New York at the time of beginning the canal, we shall the better appreciate the difficulties that were overcome by the early builders. It is not easy now to realize that this region was at that time almost a trackless forest, with large areas of swamps and marshes along the valley of the Seneca river. Benjamin H. Wright, a son of Benjamin Wright, the first chief engineer, said that as a lad he assisted in the survey of 1816, and that he could count upon the fingers of one hand the spots of ground then cultivated along the route of the survey between Rome and the Seneca river, a distance of eighty-six miles.³⁵ Almost the only towns of any size west of the Mohawk were Canandaigua and Batavia which had been established by the proprietors of large tracts of land, where they maintained their offices for the sale of lands. Throughout the state the most primitive methods of communication still prevailed. Steamboats were yet in their infancy, railroads had not been projected, and even the "Telegraph line" of stages between Buffalo and Albany, in forty-eight hours, was an enterprise of the future.

The estimate of cost, rendered from the surveys of the previous year, had contained an item of \$75,000 for the purchase of tools. Following the authority of precedents derived from the best engineers, it was supposed at that time, that it would be expedient for the State to incur the expense of purchasing these utensils. However, after mature consideration, it was thought best to let the work in short sections to contractors, who should furnish their own tools, and be paid a stipulated price per cubic yard for excavation and for embankment. As this was the initial piece of public improvements, the occupation of contracting, as we understand it to-day, was then unknown. By this arrangement of dividing the work into short sections and by the further provision of advancing money for the purchase of tools, many men of various occupations eagerly sought the

³⁵*Origin of the Erie Canal*, by Benjamin H. Wright. (Rome, 1870.)

contracts. In making these sections, the engineers so divided them as to have a brook or ravine at either end, in order that each contractor might properly drain his work without interfering with his neighbor.

The first contract was dated June 27, and on July 4, 1817, work was actually begun just west of Rome in the vicinity of the Arsenal. The people of Rome had arranged to unite the celebrations of National Independence and the beginning of operations on the canal. Accordingly, at sunrise, a large company of citizens, together with the commissioners and engineers, assembled at the appointed place. After a short address, adapted to the occasion, Judge Joshua Hathaway, president of the village, placed the spade in the hands of the commissioners. Then Commissioner Young delivered a short but graphic speech, and handed the spade to Judge Richardson, the first contractor. In his speech Commissioner Young said:

"We have assembled to commence the excavation of the Erie Canal. . . .

"By this great highway, unborn millions will easily transport their surplus productions to the shores of the Atlantic, procure their supplies, and hold a useful and profitable intercourse with all the maritime nations of the earth.

"The expense and labour of this great undertaking, bears no proportion to its utility. Nature has kindly afforded every facility; we have all the moral and physical means within our reach and control. Let us then proceed to the work, animated by the prospect of its speedy accomplishment, and cheered with the anticipated benedictions of a grateful posterity."²⁶

Then Judge Richardson thrust the spade into the ground, making the first excavation. He was followed by the assembled citizens and his own laborers, all eager to join in the labors of this memorable occasion. Thus, amid the acclamations of the people and the discharge of artillery, was ushered in this great undertaking.

During the year fifty-eight miles on the Erie canal and five on the Champlain were put under contract and one job was completed and settlement made. It was estimated that the total

²⁶Hosack's *Memoir of De Witt Clinton*, p. 455.

amount of work done, if concentrated, would have amounted to fifteen miles of completed canal. The contracts were let within the estimates of the previous year. The dimensions adopted in constructing the Erie canal were the same as recommended by the commissioners in their report of 1817, and these same dimensions were used for the Champlain canal instead of the smaller size recommended in that report.

A few facts from the report of the year's work made by the canal commissioners to the Legislature are interesting, as showing the influence some of the early experiences had on later practices. It was usually the case, when a contract was made, that the contractor desired an advance in money, in some degree proportionate to the extent of his contract, to enable him to procure teams, utensils, provisions, etc. A sum (three hundred to two thousand dollars) for this purpose was generally advanced, on the security of some responsible individual or individuals, who became jointly and severally bound with the contractor that the job should be finished by the time required, and in the manner specified in the contract, or that the money should be refunded with interest. In December following the letting of contracts, amounts of money, ranging from two hundred to one thousand dollars, were also advanced to most of the contractors, to enable them to take advantage of the market in purchasing beef, pork, flour and other stores and provisions for the next season. The contracts were drawn in such manner that every contractor was compelled to finish his whole job, and have it inspected and accepted by the engineer, before he was entitled to receive any part of his pay. The contractors, however, received a verbal assurance from the commissioners that while the works were carried on in a faithful manner monthly payments should be made, amounting nearly to the value of the labor expended on the job, calculated *pro rata* according to the prices mentioned in the contract, and deducting all previous advances and payments; but that if any attempt at deception was discovered in the works these payments should be entirely suspended, and a strict compliance with the contract enforced.

"Much useful experience has been acquired in the course of the season," say the commissioners in their report. "Many

valuable improvements have been made in the method of grubbing standing timber. It has been ascertained that much labor in excavation is saved, especially in dry ground, by the use of the plough and scraper; and it is found that banks constructed in this way, by being constantly traveled over by the teams with their loads, are much more solid, and less liable to leakage, than those which are made after the European method with the spade and wheelbarrow."³⁷

During the legislative session of 1818 but few acts were passed relative to the canals. One law authorized a survey of Buffalo creek outlet for the purpose of making a harbor. Another act incorporated the Chittenango Canal Company.

The spring of 1818 was a season of excessive rains, following an unusually severe winter. Not till nearly the first of June were the contractors able to vigorously push their operations. Investigations on the part of the two engineers led the commissioners to make two important alterations in the plans of the Erie canal. One consisted in lowering the level six feet across the Salina plains, and the other established a new summit level from Nine Mile creek to Skaneateles outlet, across the marl meadows situated there. The first change is significant, because it obviated an embankment through the territory which has become the center of the City of Syracuse. Although the new summit level necessitated two additional locks of eleven feet lift each, the change was wisely made. Experiences of all subsequent years in this locality lead us to think that, with their limited knowledge and crude methods of excavation, these early builders would scarcely have been able to succeed in their attempt at a deep cutting through this marl.

After the surveys were completed in 1818, the contracts were eagerly sought. By August all of the canal was let, except a few short sections, necessarily left at structures, and from that time till winter the work was so vigorously prosecuted, that the commissioners estimated that the whole middle section of the canal could be completed during the season of 1819.

In prosecuting their work through the forests the contractors were in need of an easy means of grubbing and clearing and their ingenuity was equal to the demand. Their inventions, though

³⁷*Assembly Journal*, 1818, p. 67.

somewhat primitive, were a long step forward and are interesting as the precursors of modern contractors' machinery. Three of them are deserving of notice. By means of a cable attached to the top of a tree and wound on a wheel worked by an endless screw, one man was able to fell the largest trees. A machine for pulling stumps was made of an axle, twenty inches in diameter and thirty feet long, supported on wheels sixteen feet in diameter; midway on the axle was fastened a third wheel of fourteen feet diameter. When the outer wheels were braced, a chain wound about the axle and fastened to the stump, and horses or oxen attached to a rope which encircled the central wheel several times, a stump was easily pulled and then carried away by the same machine, after the outer wheels had been released. The gain in power was such that, with one machine, a team of horses and seven laborers, from thirty to forty large stumps were grubbed in a day. A plow with an additional cutting blade was invented for use among small roots.

On the recommendation of the commissioners a law was passed on April 7, 1819, which authorized the construction of the canal from the ends of the middle section, westerly to Lake Erie, and easterly to the Hudson, also from the main canal to the salt works in Salina. This act also provided that the assessments on adjacent lands, as directed by the law of 1817, should be suspended until the further order of the Legislature and it enacted that men engaged in laboring on the canals should be exempt from militia duty. This last enactment was recommended by the commissioners because so much labor had been lost to the canal by militia interruptions. This law, which authorized the completion of the Erie canal, passed the Assembly without difficulty, but met with much opposition in the Senate, where, but for the loyal support of Mr. Van Buren and Colonel Young, probably it would have been defeated.

After the passage of this law, the State was in a position to accept the grant of lands from the Holland Land Company which had been made in 1814 and renewed in 1817. This grant was made on the condition that the canal be completed for boats of at least five tons burden by 1842. By the act of April 13, 1819, the State accepted this grant consisting of two tracts of land in Cattaraugus county, containing together one hundred thousand, six

hundred and thirty-two acres. Another act passed on April 7, 1819, appropriated \$12,000 for a harbor at the mouth of Buffalo creek on Lake Erie.

The winter of 1818-19 was a season which added greatly to the difficulty of canal construction. As the roads near the canal were bad in the summer, the contractors were depending on the winter for hauling materials and supplies. There was no sleighing till March and then the snow fell in such quantities as to make the opening of roads and the uncovering of materials difficult. The unusually dry spring which followed was favorable for the delivery of these materials, but the excessive and long continued heat of the summer turned the marsh land along the Seneca river into a cause of much illness among the laborers on the canal: "Between the middle of July and the first of October, about one thousand men, employed on the canal, from Salina to Secena river, were disabled by this cause. . . . It was impossible to prevent some jobs from being entirely abandoned for several weeks."⁸⁸

However, before the end of the year the middle section of the Erie canal and the side-cut at Salina were completed with the exception of a few trifling pieces of work, which could be finished without interfering with navigation. On October 22, 1819, the first boat sailed on the canal from Rome to Utica. This boat was called the "Chief Engineer," in honor of Benjamin Wright. On the next day the canal commissioners, and a number of others made the return trip to Rome. The following excerpts from a letter written by a gentleman in Utica to the editors of the *Albany Daily Advertiser*, give a good description of the events of these days. The writer says: "The last two days have presented, in this village, a scene of the liveliest interest; and I consider it among the privileges of my life to have been present to witness it. On Friday afternoon I walked to the head of the grand canal, the eastern extremity of which reaches within a very short distance of the village, and from one of the slight and airy bridges which crossed it, I had a sight that could not but exhilarate and elevate the mind. The waters were rushing in from the westward and coming down their untried channel towards the sea. . . . The interest manifested by the whole country, as this new internal

⁸⁸*Assembly Journal*, 1820, p. 455.

river rolled its first waves through the state, cannot be described. You might see the people running across the fields, climbing on trees and fences, and crowding the bank of the canal to gaze upon the welcome sight. A boat had been prepared at Rome, and as the waters came down the canal, you might mark their progress by that of this new Argo, which floated triumphantly along the Hellespont of the west, accompanied by the shouts of the peasantry, and having on her deck a military band. At nine the next morning, the bells began a merry peal, and the commissioners, in carriages, proceeded from Bagg's hotel to the place of embarkation."²⁹

During the season of 1819, exploring parties were employed on both the eastern and western sections. Valentine Gill made surveys to ascertain the most feasible route from Palmyra to Buffalo creek. His line led westerly from Palmyra to a point on the Genesee river, about twelve miles south of Rochester, thence westerly to the Buffalo creek. The commissioners concluded that it would be best to reject the easterly part of Mr. Gill's line extending from Palmyra to the Genesee river and to decide in favor of the more northerly route as surveyed by Mr. Geddes in 1816. They also deemed it advisable to defer action relative to fixing the route west of the Genesee river until other examinations could be made. The southern route, which ran through the Holland Purchase, was objectionable because it was feared the water-supply would be deficient, as the canal would have to be carried far above the level of Lake Erie. The summit level, as located by Mr. Gill, was about ninety-four feet above the lake. Canvass White had charge of a party making surveys between the Seneca and Genesee rivers. In October the canal commissioners met in Utica, and after considering the various routes covered by White's surveys, decided in favor of the line as originally explored in 1816.

At this meeting it was determined to place under contract this section of about sixty-three miles between the Seneca river and Rochester, on the Genesee river, and also a portion of the eastern section, twenty-six miles long, extending from Utica to Little Falls. Before the end of the year parts of this work were let to contractors,—twenty miles of the western section, from the

²⁹Watson's *History . . . of the Western Canals*, p. 80.

Genesee river to Palmyra and eight miles of the eastern section, just east from Utica.

This action of extending the canal in both directions brings to light a condition of affairs which threatened the continuation of the canal to the western lakes. In his speech at the opening of the Legislature, in 1820, Governor De Witt Clinton gives the reasons which governed this action of the commissioners. He says: "The object and tendency of that measure of the canal commissioners must be obvious; and policy as well as justice concurred in recommending its adoption. By operating in both directions, a solemn pledge is given of our determination to finish the whole canal; sectional jealousies are allayed; the advantages arising from pecuniary expenditures are impartially dispensed; and every advance of the work, in either way, will facilitate communication."⁴⁰

The opponents of the canal considered this a favorable time to strike another blow, which they hoped would be fatal to the continuation of work. Their plan was to prevent the building of the western section by completing the eastern section first and so adding to their numbers the large population of the east, whose local needs would then be satisfied.

In the speech previously referred to, Governor Clinton had given warning of this plan of attack in these words: "But as there is great reason to apprehend the exertions of insidious enmity, I consider it my solemn duty to warn you against them. As the canal proceeds to the west, the country east will of course be accommodated; and in proportion to its progress to accommodation, in that ratio, will it be considered more easy to resist the attacks of a greater mass of population against its further extension. Attempts have already been made to arrest its progress west of the Seneca river; and it is highly probable that they will be renewed when the work is finished to the Genesee."⁴¹

During the legislative session the Assembly appointed a committee to "inquire into the expediency of directing the canal commissioners . . . to delay the construction of a canal west of Seneca river, until the northern canal, and the western

⁴⁰*Assembly Journal*, 1820, p. 12.

⁴¹*Id.* p. 11.

canal from Utica to the Hudson be completed.”⁴² Fortunately for the canal interests, the Legislature took the broad view of the greatest benefit to the whole State, rather than the narrow policy of sectional prejudices, and it decided not to interfere with the plans of the canal commissioners. In the language of the commissioners in answer to the inquiries of the Assembly committee, the Legislators were able “to comprehend the interesting truth, that this state can never enjoy a tenth part of the advantages of the Erie canal, till the tide of inland commerce, of which it is to be the channel, is permitted to flow, without a mile of portage, from the great lakes to the Atlantic.”⁴³

On February 18, 1820, the canal commissioners made their annual report to the Legislature. In reporting the completion of the middle section they mentioned some interesting facts in explaining the causes of the increased cost over the original estimate. They say:

“The original estimate of the middle section, extending from Utica to the Seneca river, in the aggregate amounted to \$1,021,851. The real cost of its construction has been \$1,125,983, making an excess of expenditure over the estimate of \$104,132, a little more than 10 per cent.” This made “an average expense, per mile, including everything, of \$11,792.”⁴⁴

That the cost should exceed the original estimate is not strange, but on a work so gigantic for the times, through a virgin forest, and executed by men entirely lacking in previous experience, it is indeed strange that the excess was so small.

One of the causes for this additional expense was the change from the standard width of canal in embankment, where it was and was intended to be only thirty feet wide at the water surface. Several changes were made in the plans, adding to the expenses;—some of the aqueducts were constructed of stone where wood was intended; bearing piles were found necessary in the foundations of locks and aqueducts; and waste-weirs, for which provision had not been made, were added. The greatest source of unforeseen expense was found in hard excavation, for which additional payments were allowed to the contractors.

⁴²*Assembly Journal*, 1820, p. 516.

⁴³*Id.* p. 671.

⁴⁴*Id.* p. 452.

Although the precaution had been taken to determine the character of the soil by boring with augers prior to letting contracts, the commissioners gave the contractors verbal assurances that if "the excavation was manifestly worse than it was represented to be, then they would pay for the extra difficulty arising from that cause, such sum as the engineer should deem reasonable, over and above the stipulated prices."⁴⁵

Another cause, which is given as adding to the cost, becomes very interesting in the light of later facts. The commissioners say of it: "The waterproof lime, which has been used, during the past season, for the most of the mason work done on the canal, has contributed to swell our disbursements beyond our original estimates. This material has been discovered in the progress of our exertions; and it will doubtless hereafter be considered as an article of prime necessity, throughout our country, for all hydraulic masonry."⁴⁶

Canvass White, an engineer on the work, was instrumental in making the discovery of this lime rock, and to him belongs the honor of producing the first hydraulic cement in America. The discovery came about in this manner:

"The first works of masonry on the Erie Canal, were contracted to be done with common quicklime. Mr. Mason Harris, and Mr. ——— Livingston, of Sullivan, Madison county, entered into a contract to furnish a quantity of this lime for the construction of culverts, aqueducts, &c., on the middle section of the canal, between Rome and Salina. They burned a large kiln and commenced the delivery of it. The purchasers, upon trial, found that it would not slack; all were greatly surprised who heard of the facts, and wondered at the singularity. The circumstance became common talk among all classes, in any way engaged in canal matters, and finally became known to the engineers, of whom Canvass White was one, and Judge Wright another, who took an interest in the affair. The article was examined, and the ledge from whence it was taken. Dr. Barto, a scientific gentleman from Herkimer County, was called upon to make experiments, to prove what this new substance should be. He came on, took some of the rough stone, and in the trip

⁴⁵*Assembly Journal*, 1820, p. 453.

⁴⁶*Id.* pp. 454-455.

hammer shop of John B. Yates, at Chittenango, burned a parcel, pulverized it in a mortar, and in Elisha Carey's bar-room (the present Polytechny), in the presence of Messrs. Wright, White and several others, mixed it with sand, rolled a ball of it, and placed it in a bucket of water for the night. In the morning it had set, was solid enough to roll across the floor, and by Dr. Barto pronounced cement, not inferior to the Roman of Puteoli, or the Dutch Tarras of the Rhine. Mr. White had recently returned from England, where he had been to examine bridges, canals, aqueducts, culverts, &c., of that country, and the materials of which they were made.

"At considerable expense, and by repeated experiments, he found this to be an excellent substitute for the Roman cement, and he sought for and obtained a patent right of the United States for this discovery. . . . Mr. White devoted considerable time and money in making experiments, and in introducing this cement, amidst the doubts and fears which essentially operated against the general use of it. It was at first used with great reluctance and caution; commissioners, builders and particularly masons, were entirely opposed to its use."⁴⁷

Benjamin Wright says: "The canal commissioners made no provision for the importation of cement. They appeared to think, that common quick lime would do for the work, although I suggested to them, in writing, in 1818, the propriety of making provision for cement, against the commencement of the year 1819, either by importing Tarras or Roman cement. . . . I have no hesitation in saying, that the discovery of hydraulic cement by Mr. White, has been of incalculable benefit to the State, and that it is a discovery which ought, in justice, to be handsomely remunerated."⁴⁸

John B. Jervis says of Mr. White: "I well recollect his diligent examination of the stone quarries, and his experiments during his search for suitable material."⁴⁹

At first, on account of the expense of importing cement, and because of a lack of confidence in the new American product,

⁴⁷History of Onondaga County, entitled *Onondaga or Reminiscences of Earlier and Later Times*, by Joshua V. H. Clark, Vol. II., p. 64. (Syracuse, 1849.)

⁴⁸*Assembly Journal*, 1824, pp. 1007-1008.

⁴⁹*Facts and Circumstances in the Life of John B. Jervis, by himself*. Never published, manuscript in Jervis Library, Rome, N. Y.

the structures were built with common lime mortar, but these works soon failed and required extensive repairs or rebuilding. After the merits of the the new cement were recognized, it was universally used in the construction of the canal, and was exported from the state in large quantities. Under a promise from the canal commissioners that a just compensation would be allowed, Mr. White allowed the general use of this cement, but finally, after vainly waiting for the fulfilment of this promise, he brought suit against one of the manufacturers and obtained judgment. Then a petition for relief having been received by the Legislature from this manufacturer, an attempt was made to appropriate the sum of ten thousand dollars as compensation to Mr. White for the benefits derived from his discovery, and this measure had the approval of the Governor and canal commissioners. However, this attempt failed, although it was estimated that at least five hundred thousand bushels of the cement had been used in the building of the canal, and the contractors were liable to judgments aggregating sixty thousand dollars, if suits were brought against them.

The commissioners also stated in their report that on the middle section, the inside slope of the banks had generally been one foot rise to eighteen inches horizontal base, but that they had determined to use a flatter slope in the future.

The laws of 1820 in regard to canals related chiefly to their government; the rights and conduct of boatmen and the general public were prescribed; the duty of collectors defined, and the canal commissioners empowered to establish rates of toll and to make regulations.

The subject of collecting the tax on lands lying within twenty-five miles of the canals was again discussed by the Legislature of 1820, but the Assembly committee reported against it, and the matter was allowed to rest where the law of the previous year had left it, and the collection of this tax was never made.

Following the completion of the middle section, which included a lateral cut to Salina from Syracuse, a memorable celebration occurred in Syracuse on July 4, 1820, in honor of the completion of the task, the date being exactly three years from the time of commencing the work. Arrangements of an extensive nature had been made for the event, and on the morning of Independence

Day large delegations from the counties of Genesee, Cayuga, Onondaga, Madison, Oneida and Ontario, assembled in that city at the basin formed by the junction of the Salina side-cut with the Erie canal. Many of the people arrived in boats, which came on the canal, and altogether seventy-three boats of various sizes, with gay decorations, were present at the festivities, the appearance of the fleet being enhanced by the display of handsome banners in the hands of those aboard the vessels.

One of the boats was the "Oneida Chief," which conveyed Governor Clinton, Attorney-General Oakley, Speaker Spencer of the Assembly, Myron Holley, one of the canal commissioners, and many other distinguished gentlemen from different parts of the state. The crowd, which numbered several thousands, listened to a pertinent address by Samuel M. Hopkins of Genesee county, after which the boats formed in line and the procession moved down the lateral canal to the basin at Salina. At this place the usual festivities incident to great and joyous public occasions concluded the celebration.

As the time approached for interfering with the works of the Western Inland Lock Navigation Company, the necessary steps were taken for acquiring the rights of that company. It will be recalled that the commissioners appointed by the act of April 8, 1811, had been directed to ascertain the terms on which these rights would be surrendered to the people of the State, and had reported that the demand of the company for \$190,000 for its shares, exclusive of the 350 shares held by the State, was deemed excessive. An act passed June 19, 1812, empowered the commissioners to purchase the rights of the company, but the authority was so conditioned as to render it inoperative.

Now as the progress of construction would prevent further use of the company's works, the provisions of the law of April 15, 1817, were carried out by the appointment of appraisers by the Justices of the Supreme Court. On October 2, 1820, the transactions were closed by the acceptance, on the part of the company, of \$91,616, the amount of damages awarded by this board of appraisers. Thus ended the Western Inland Lock Navigation Company—the hope of the early dreamers, who saw the great possibilities of the western country, and who, like their brothers of all ages, have been called impractical and visionary, because

they lived in advance of their time. But their wildest dreams did not attain to the canal which now, after the lapse of little more than a century, is about to follow the course of the old company's navigation—up the Mohawk, down Wood creek, across Oneida lake, down Oneida river, then branching and going up the Seneca and down the Oswego to Lake Ontario.

During the year 1820 work on the canal was carried on with greater economy than in any previous year. The number of responsible contractors bidding for work had increased, while the price of labor had been reduced. The work of opening both the eastern and western sections was pushed forward under contracts reduced from thirty to forty per cent.

Two new and more detailed surveys, other than those of Messrs. Geddes and Peacock, were made to determine whether the northern or southern route between the Genesee river and Lake Erie would be the better. The southern route had the advantage of being several miles shorter, of requiring less expenditure in construction, and of passing through those western settlements established by the Holland Land Company. As this company had given such a large tract of land in support of the canal, the commissioners endeavored to do everything in their power to please the company. But when these new surveys had been completed and the quantity of water available for feeders had been estimated, the southern line was deemed impracticable. The summit of this route was found to be seventy-five feet above the surface of Lake Erie, so that not only would the canal be deprived of this inexhaustible source as a feeder, but the supply from any intermediate creeks or watercourses was considered as entirely inadequate to furnish the volume of water necessary to overcome the leakage in embankments and the loss from the use of so many additional locks as this line required. This route was accordingly abandoned and the northern line adopted, which nowhere rose above the level of Lake Erie.

The attention of the canal commissioners was, therefore, especially directed to the northern route, and they appointed David Thomas, as engineer, to make surveys of this line. The results of his examinations were gratifying to the commissioners and confirmed their former favorable impressions of this line. Mr. Thomas' survey extended from the Genesee river to Tonawanda

creek, a distance of about seventy-two miles, including the deep cutting through the mountain ridge. Throughout the survey, the face of the country, the nature of the earth to be excavated and the character of the streams to be passed were so well understood as to make it possible for the line to be speedily prepared for the contractor.

In this year, 1820, from the Genesee river easterly there were fifty-one and a quarter miles of canal either completed or under contract, including the whole distance from that river to Montezuma, with the exception of about nine miles. This distance had not yet been placed in a condition to be opened, because the appropriations would not warrant the letting of contracts for the whole distance between Rochester and Montezuma, and because there already extended from near one end of these nine miles to the other, a circuitous and imperfect navigation by means of the Canandaigua outlet and the Seneca river. This work was placed under contract in 1821, ample appropriations having been made by the Legislature of that year.

In these fifty-one and a quarter miles of canal, two important deviations were made from the route traced in 1816, both being considered improvements over the original suggestions. One of them consisted of a new method of crossing the valley of the Irondequoit creek. In place of the original line, which would require an embankment of a quarter of a mile long and sixty-five feet high from the bottom of the valley, it was found that by carrying the line a short distance further north, this great embankment could be divided into two parts, which together would not contain more cubic yards than the one on the first route. This division was deemed prudent because the soil, being chiefly sand and gravel, was not well adapted for embankments, and hence the canal commissioner adopted the new line. However, they again changed the plan, concluding to substitute an aqueduct of wood in place of the larger of the two embankments, the change being made in the interest of economy. Before work was begun on this aqueduct another change of plan was made, as will be seen later. The other alteration consisted in carrying the line on the south side of Mud creek, from a point west of Palmyra to a point west of Lyons, the distance between these two points being about fourteen miles. The line, as explored in 1816, was

on the north side of this creek, but the change was recommended, because the new route would be less expensive and would pass through earth more suitable for insuring the canal against injurious accidents when filled with water, and also would shorten the length of the canal by about two and a half miles. The new route was examined and found practicable by Nathan S. Roberts. Mr. Geddes, who surveyed the western section in 1816, at that time had suggested the propriety of examining this new route.

The canal commissioners had no doubt of an abundant and permanent supply of water from Lake Erie, as the canal descended to the eastward until it reached the Seneca river. But as a precautionary measure, they planned to construct the canal between the locks at the mountain ridge and the Genesee river, with a descent towards the east of one inch in every mile. This would save the expense of at least one lock and would permit a current towards the east so as to require but little water from the Genesee river; and it was believed that this necessity could be still further reduced, if expedient, by a feeder from the Irondequoit creek. It had been supposed that this creek could not be drawn upon for the canal, but an examination by David S. Bates, resident engineer, showed that the waters of this stream could be taken into the Erie at Pittsford. Further examination showed that a sufficient supply could be obtained from the Canandaigua lake, Mud creek and several other sources for all the demands of the canal, if the river failed.

On the ninety-six miles of the middle section, which had been completed, navigation began in May, 1820, and from then until the close of the season \$5,244.34 had been collected in tolls. In addition to this amount \$450.56 was collected at the Little falls of the Mohawk, after the rights of the Western Inland Lock Navigation Company were transferred to the State. This toll was charged from Rome to the lower lock at the falls. The following list of the rates of toll is of interest as showing the amounts charged when the canal was first opened and as indicating the staple articles of commerce at that time:

"Salt, 5 mills, per ton, per mile, (7 barrels of 5 bushels, each, or 40 bushels in bulk, being a ton).

"Gypsum, 5 mills per ton, per mile.

“Flour, meal, and all kinds of grain, salted provision, pot and pearl ashes, one cent, per ton, per mile.

“Merchandise, two cents per ton, per mile.

“Timber, squared and round, five mills, per thousand solid feet, per mile.

“Boards, plank, and scantling, reduced to inch measure, and all siding, lath, and other sawed stuff, less than one inch thick, 5 mills, per thousand feet, per mile.

“Shingles, one mill, per thousand, per mile.

“Brick, sand, lime, iron-ore, and stone, 5 mills, per ton, per mile.

“Rails and posts for fencing, two cents per thousand, per mile.

“Wood, for fuel, one cent, per cord, per mile.

“All fuel to be used, in the manufacture of salt, to pass free.

“Boats made and used chiefly for the transportation of property, on each ton of their capacity, one mill per mile.

“Boats made and used chiefly for the carriage of persons, 5 cents, per mile, of their passage.

“Staves and heading, for pipes, one cent, per thousand, per mile.

“Staves and heading, for hogshead, 7 mills, per thousand, per mile.

“Staves and heading, for barrels or less, 5 mills, per thousand, per mile.

“All articles not enumerated, one cent, per ton, per mile.”⁸⁰

The cost of maintaining and operating this section had been excessive, the embankments, being new, had settled and broken, making the repair accounts larger.

The previous year marked the beginning of construction work on the eastern section and a portion of the line eastward from Utica for thirty miles was at the close of 1820 nearly completed. Eight miles had been connected with the Rome level and was ready to be filled with water. Excellent progress had been made on the remaining twenty-two miles and also on the western section, where the greatest difficulties in excavation were experienced. From Utica to Minden there was a fall of one hundred and five feet, which was to be descended by thirteen locks. During the

⁸⁰*Assembly Journal*, 1821, p. 871. Canal Commissioners' Report.

year the contracts for building these structures were let and the necessary building materials placed at the points where these were to be constructed.

In the following year, 1821, the law-makers were aware of the fact that great advantages were offered in the cheapness and abundance of labor and in the low rate at which money could be obtained for the accomplishment of this work. Therefore, they enacted chapter 36, which empowered the commissioners of the canal fund, in addition to loans already authorized by law, to borrow one million dollars and also the same amount in the year 1822 to defray the cost of construction work, a portion of the money to be also applied towards the work on the Champlain.

Early in 1821 a contract was let for building a culvert to carry the Irondequoit creek under the canal, and the work was completed in October. As originally planned in 1820 the valley was to be crossed on a wooden aqueduct, but it was feared that the winds might have a disastrous effect upon such a structure, and consequently a new method was adopted. The culvert was a structure of very substantial masonry; it was supported by piles, had a semi-circular arch of twenty-six feet span and extended under the embankment, at right angles with the canal, two hundred and forty-five feet. Much difficulty was experienced in preparing the foundation because of the quicksand encountered, and in order to sustain the enormous weight of the stone arch, and the embankment resting upon it, more than nine hundred piles were driven, each about a foot in diameter and from twelve to twenty feet long.

That portion of the canal running through the Cayuga marshes was found to be far more difficult of construction than had been anticipated. Quicksands were encountered, frequent rains drove the contractors from their work and illness broke out among the laborers, making it extremely hard to obtain men enough to make satisfactory progress. But when winter approached the work was prosecuted unremittingly. Also in 1821 contracts were let for that portion of the canal from the brow of the mountain ridge in Niagara county to the Tonawanda creek. Through the ridge the canal required very deep cutting, most of it through solid rock. It was a trifle over seven miles long, and the end nearest the Genesee river was joined to the level extending across

that river by five pairs of combined locks which, in the aggregate, had a lift of sixty feet. At the upper lock the excavation was about thirteen feet in depth, and from here the ground rose for a mile and a half to a point where the depth of excavation was thirty feet and six inches. From here there was a gradual descent to the Tonawanda creek, where the depth of cutting was about twelve feet. This depth of excavation would give the canal four feet of water when Lake Erie was at its lowest point.

In June of this year, contracts were let for building a feeder from the Genesee river. It was to be two miles long, being located on the east side of the river, and having a width at water-surface of twenty-six feet, with a three-foot depth of water. An aqueduct was also contracted for, to be built across the same river.

On the middle section in 1821 navigation was interrupted for a short time only, and the total amount of tolls collected was \$23,001.63, a portion of this revenue also being derived from the old canal at Rome. During this season work on the eastern section had been greatly extended and contracts entered into for its entire completion to the navigable waters of the Hudson. Navigation had been opened between Utica and Little Falls and from the latter place to Schenectady much of the excavation was completed. In order to accommodate the public a wooden lock was constructed at German Flats, which connected the Erie canal with the navigable waters of the Mohawk, thus affording an uninterrupted boat navigation from Schenectady to Cayuga and Seneca lakes.

The location of the canal between Little Falls and the Hudson caused the engineers and commissioners much solicitude. The engineers, Wright and White, made repeated investigations to discover some route other than that along the valley of the Mohawk. As their efforts were unavailing the commissioners were forced to adopt a line through this valley until the Cohoes falls were reached. Beyond the falls the canal bore to the south and conforming to the gradual descent of the ground, took a direct course to Albany where the junction with the Hudson was made, as well as another connection with this river opposite the City of Troy. The principal difficulties of construction through this valley occurred in the narrow passes of the Mohawk,

where the hills terminated abruptly at the water's edge, rendering it necessary to build the canal wholly in the river or partly in the river and partly in the bank. In either case, high embankments were needed to carry the canal above the floods, and these embankments had their bases in the river and required a covering of stone. The magnitude of these embankments, the quantity of stone required to protect them, the difficulty of excavation, which frequently was of rock, rendered these sections the most expensive of the whole undertaking.

Between Schenectady and Cohoes falls these obstacles were so great on the south side of the river that it was finally decided to cross to the north side and, after passing the most difficult places, to recross the river. After vainly trying to suitably locate the canal on the south side, Canvass White decided to try a line along the other side, and finding this much more favorable he recommended crossing the river twice. Benjamin Wright and James Geddes, the two senior engineers, after carefully examining the situation, corroborated Mr. White's opinion. Accordingly aqueducts were built, one at a place known as Alexander's Mills, about four miles below Schenectady, and the other at the locality called Fonda's Ferry, about four miles above Cohoes. The portion on the north side of the river between these aqueducts was about twelve miles long. The estimates of cost of the two routes showed the economy of constructing the canal for a distance on the north side. They were as follows: south route, \$279,949.09; north route, including the two aqueducts, \$204,178.18; balance in favor of the latter method, \$75,770.91.

While the Legislature was in session in 1882, an act (chapter 274) was passed, regulating the speed of boats on the canals. The matter was embodied in section 4, and reads: "No boat or craft, or floating timber or lumber, shall move on either the Erie or Champlain canals, faster than at the rate of four miles per hour, without permission in writing, and signed by a majority of the canal commissioners." The penalty for each offense was to be ten dollars.

In 1822, two hundred and twenty miles of canal were open to navigation. Contracts for constructing a tow-path along Tonawanda creek were let, and also for building a dam at its mouth.

The work of excavating in the rock cut at the mountain ridge proved to be more difficult than was at first expected, owing to the shelly condition of the rock and the slight effect of powder upon it. As the work progressed so slowly here, and as complaint had been made that the excavation could not be done at contract prices, the commissioners determined to adopt a new method. The work was divided into smaller sections; the former contractors were retained but were required to employ as many laborers as the commissioners demanded; an assistant engineer was placed on the work to inspect the whole course of operations and to keep an account of all expenses necessarily incurred in the prosecution of the work, and the contractors were paid reasonable prices according to the engineer's accounting. Under this plan good progress was made and with little more expense.

Some trouble was experienced in building the Genesee river aqueduct on account of the smooth, sloping surface of the rock upon which the foundations of the piers rested. The first pier, which had been partly built on this rock, was carried away by the swift current in the river and those built thereafter were sunk into the rock six inches.

During this entire season the middle section was open to navigation and a larger amount of tolls collected than in the former years. The construction of the eastern section was being pushed forward rapidly, as it was expedient to obtain all the revenue possible from tolls so as to pay the interest on the canal debt. In November water was admitted to that portion between Little Falls and Schenectady without any serious breaches or leaks following. Shortly afterward navigation beyond a place known as the "Nose" was suspended during the construction of a feeder from the Paper Mill creek, and while the lining of the canal between the "Nose" and Schenectady was in progress. Work between the latter city and Albany was being successfully prosecuted, five of the locks being completed and excavations on the others finished.

At Schenectady a change of location had been made after the canal had been partly constructed. Mr. Jervis' description of the change discloses an interesting bit of local contention. He says: "Schenectady is built upon a tongue of land that projects from the hill on the south side, to the shore of the

Mohawk river. Above this tongue of land, the interval lands of the Mohawk extend about three miles, and in most part about half a mile wide, terminated at the upper end by the hill that strikes the river. The canal was locked down at the upper end of this interval land, so as to carry a cutting or excavation through the central portion of this interval, of one to six feet in depth. As this line neared the city, it curved off to the shore of the river, and so passed the tongue of land between the city and the Mohawk River. This made a cheap line to construct. This piece of canal was nearly constructed over the interval land, and some work was done along the river shore. This line had been opposed, as being liable to damage from river floods, and as there was a local interest in the location, the matter was a good deal discussed among the citizens. One party favored the location as made, and another contended for a line through the center of the city, through the elevated tongue of land above described.

"At that time it was considered the business of the city would center on the canal, and hence the local excitement. One party was led by Governor Yates, and the other by R. Gevins, the proprietor and keeper of Gevins Hotel. The commissioners and engineers were guests at the hotel, and Mr. Gevins did not lose the opportunity of influencing, so far as he could his guests, on the question of location, and was very active in looking after the route through the city, which would most probably run near his hotel. At this time a heavy flood occurred in the Mohawk River, rising over the banks of the canal, and gave great force to the objection that had been raised, as to such dangers. This so impressed the engineers that they saw the necessity of some change, either by a new line, or expensive guard banks to protect the canal in time of flood. This circumstance gave energy to the Gevins party, and though much work had been done, they succeeded in impressing on the engineers and commissioners the necessity of a change in the location. Mr. Gevins was a sagacious man, and one that could keep his own counsel; and finally succeeded in inducing the engineers to run a new line through the city, and finally in getting the canal authorities to vacate the river line, and locate through the central portion of the city. The day after this was done,

it so happened that Gov. Yates and Mr. Gevins met at the halfway house, between Schenectady and Albany. Mr. Gevins said to me that Governor Yates called him out privately, and gave him a severe reproof for the course he had taken—saying ‘he (Gevins) was an uneasy Yankee and could not be kept still.’ Mr. Gevins said he took the rebuke very quietly, knowing the matter was settled.

“The plan this measure gave rise to, was to take up the lock at the upper end of this interval, and raise the canal banks to correspond with the new level. The former excavation was not filled up, leaving the water in the canal, six feet extra depth. The alluvial land was supposed to be water-tight, but it was found afterwards, after water was let in, to be full of holes, like pipe stems, made by the decay of aqueous roots, and gave a good deal of trouble to secure the banks against this difficulty. In some cases long courses of sheet piling was put in, but the method adopted for the most part, was to line the sides and bottom with sand from the hill. It was not until midsummer that this section of canal was so improved as to hold water for navigation.”⁵¹

In 1822 the canal commissioners had not yet decided upon the location of the western terminus of the canal, and an intense rivalry existed between the villages of Buffalo and Black Rock as to which place should be selected. In this year the Legislature passed a law (chapter 251) giving aid and encouragement for harbor construction, and the citizens of both places were under the impression that this course was taken in order to determine which village could provide the most advantageous port, and that the decision of the commissioners would be governed accordingly. Consequently there was some vigorous harbor-building and an unremitting warfare was maintained. The newspapers were in the thickest of the fight and championed the cause of their respective villages, each side claiming superior advantages for a port.

At this time Gen. Peter B. Porter, (who in 1810 had introduced a bill in Congress for building canals, and had been a canal commissioner from 1810 to 1816) and other residents of

⁵¹*Facts and Circumstances in the Life of John B. Jervis, by himself.* Manuscript in Jervis Library, Rome, N. Y.

Black Rock proposed to construct a pier, and in June the canal commissioners adopted a resolution, stating that if these people were successful in constructing a certain portion of this pier by a given time and in a satisfactory manner, they (the commissioners) would either construct the canal basin desired, or else recommend that the State reimburse the individuals for the amount expended. This action of the commissioners resulted in the organization of the Black Rock Harbor Company, which built what was called an "Experiment Pier." These proceedings incited the Buffalo people to renewed energy; they made numerous claims that the pier would be destroyed by the first run of ice.

The canal commissioners gave a hearing in Buffalo, in the summer of 1822, relative to the location of the terminus. De Witt Clinton, as chairman of the board, presided and associated with him were Messrs. Van Rensselaer, Seymour, Holley and Young. Gen. Peter B. Porter was the spokesman for Black Rock, and Samuel Wilkeson represented Buffalo. Both men had the welfare of their respective villages at heart and with all the ability they possessed each advocated the merits of his own town as a canal terminus. The outcome of the meeting was the selection of Buffalo, chiefly on the ground that the water could be taken out of the lake at a higher elevation than from the river at Black Rock, thus saving a large amount of excavation along the whole Lake Erie level.

But the decision of the commissioners did not end the controversy. In the spring of 1823, the predictions of the Buffalonians that the pier at Black Rock would not withstand the ice, did not prove true and this fact led some of the commissioners to favor further improvement at this point. Consequently the war of words continued with greater activity. But the question of Buffalo as the canal terminus was definitely settled in the official announcement made by the canal commissioners in their annual report for 1823.

There was a most interesting feature of the contest between Buffalo and Black Rock during the year 1823 and it plainly showed to what extremity either place manifested a willingness to go in order to gain a victory. In Buffalo there was much alarm because it was believed that the commissioners had deter-

mined upon Black Rock for the terminus, and the citizens of the former place circulated a subscription paper headed with the following:

"Whereas, The late decision of the Canal Commissioners, terminating the canal at Black Rock, upon the plan proposed by Peter B. Porter, will be injurious to the commerce of Buffalo and, in a great measure, deprive the inhabitants of the benefits of the canal—in order, therefore, to open an uninterrupted canal navigation upon the margin of the Niagara river, on the plan proposed by David Thomas,* from the point where the line established by him will intersect Porter's basin, to the point where it is proposed to dam the arm of said river to Squaw Island, the undersigned agree to pay to Henry B. Lyman, the sums annexed to their respective names to be for that purpose expended under the direction of the trustees to be appointed by the subscribers."⁵² The notice also stipulated that "no part, however, of any subscription is to be called for until the expenditure of the whole shall be authorized by the canal commissioners, upon the plans herein proposed." The amount subscribed was \$11,415 and in addition to this amount a half acre of land was donated by one resident.

With the location of the terminus permanently settled, there followed a marvelous growth of the City of Buffalo. Previously Black Rock had eclipsed the former place in growth, but that village reached its most prosperous period with the completion of the harbor improvements. The pier was gradually destroyed, most of the structure being carried away by a freshet in May, 1826, which precluded all hope of the village ever becoming an important commercial port.

The new "Constitution of 1822" took effect at the close of that year. Judge Lincoln, in his *Constitutional History of New York*, remarks that "the subject of canals occupies only a small space in the Constitution, but it embraced the following propositions: Canal tolls at a rate not less than that already fixed by the canal commissioners were established and continued. The canal tolls, the duties on salt, auction duties, and the revenue

*This plan was substantially the one finally adopted by the canal commissioners.

⁵²White's *History of Erie County*, Vol. I., pp. 282-283.

raised in lieu of the steamboat passenger tax, were inviolably appropriated for canal purposes, without change of rate or division until all expenses and debts incident to the construction of the canals were fully paid. The legislature was prohibited from selling or disposing of the salt springs, or salt lands, or the canals."†

In commenting upon this, the first appearance of the canals in the Constitution—a concession to their growing importance—which was not obtained without vigorous opposition in the convention of the previous year, which framed it, the authority quoted says that this was not creative legislation. The canal was then under construction, and the Legislature had already provided funds for the purpose. It was no part of the scheme of Clinton and his associates to resort to direct taxation for the means to build the canals. It was believed that their tolls would pay for their construction and maintenance. The policy was already firmly established. However, to place the matter beyond peradventure, and to pledge the faith of the State to the maintenance of this policy, existing legislation was crystallized in the manner indicated.

The Legislature of 1823 passed a law (chapter 111) authorizing the construction of a basin in the City of Albany at the termination of the Erie and Champlain canals.

In the spring of 1823 there were very heavy snow storms and these were followed by copious rains in the fall and an early winter, so that there was only a short season for navigation and work on the canal. The great aqueduct across the Genesee river was completed during the year. It was eight hundred and two feet in length, consisted of eleven arches supported by the necessary abutments and piers, was surmounted by strong parapet walls properly faced on both sides, and protected on the top by a coping of very large and beautiful limestone. The whole work was laid in good waterproof lime and thoroughly grouted. The bottom of the trunk was built of flagstone, well fitted together and bedded in thin mortar, while a substantial but plain iron railing protected the outside of the towing-path.

Considerable anxiety had been felt about the safety of the great embankment across the Irondequoit valley, and on several

†*Constitutional History of New York*, Vol. I., p. 715.

occasions, fears were raised as it was thought to be weakening and about to break. The alarm was caused by the discovery of some leaks, but a careful examination proved that the fears were groundless.

During the fall of 1823 quicksands in the Cayuga marsh level subjected navigation at this point to some inconvenience. This level was connected without lockage with the Seneca river and when the river was at its lowest point it was impossible for heavily loaded boats to clear the bottom and the services of lighters were required. The canal commissioners concluded to make further excavation if the trouble occurred again, and if this proved to be ineffectual, the source of complaint would be remedied by the construction of a lock with a small lift which would sustain the water at an elevation suitable for navigation at all times. This course was subsequently pursued in the winter of 1824-5.

As is told in the chapter concerning the Oswego canal, the locks at Salina were completed in 1823, the side-cut was extended to Onondaga lake, and the lake was lowered by cutting a new outlet, thus permitting navigation from the Erie canal through the lake to Seneca river.

On the Schenectady level it was found necessary to have a greater water-supply. A dam was, therefore, thrown across the Mohawk at Johnsville, raising the river high enough to feed its waters into the canal. While the dam was in course of construction the embankments near Schenectady were lined and strengthened. The dam was completed in September and plenty of water derived for the purposes desired.

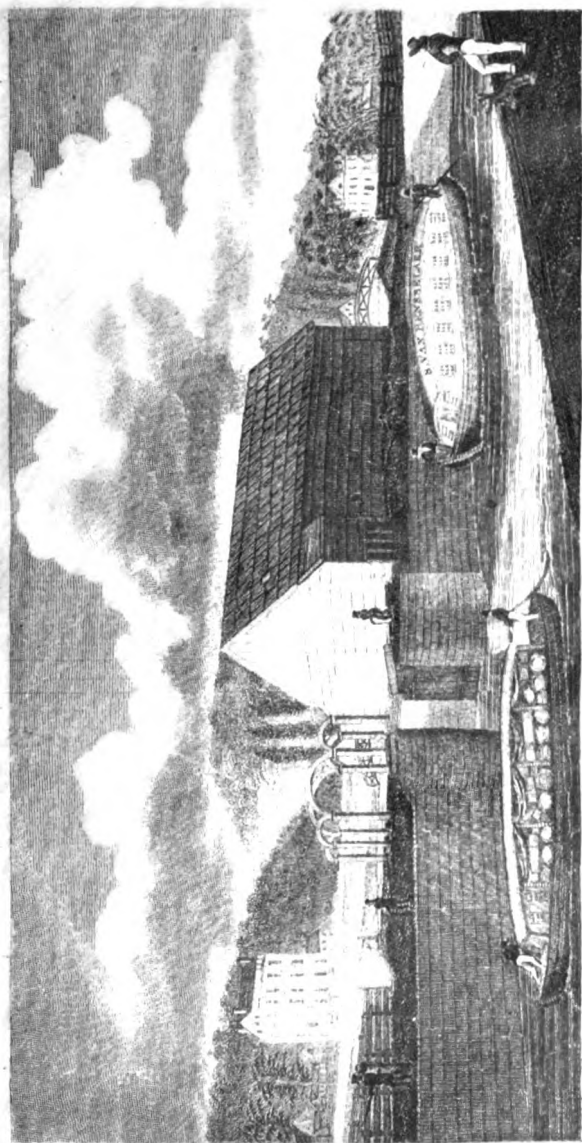
The eastern section of the Erie canal and the Champlain waterway were completed by October 1, 1823, thus making a continuous canal navigation from Genesee river to Albany and from Whitehall, at the head of Lake Champlain, to the latter city. The Mayor and other officials of Albany, together with several local societies, made extensive preparations to commemorate the completion of the work and on October 8, imposing ceremonies were held in that city. New York City was invited to take part and a delegation of prominent men engaged passage from that city on the "Chancellor Livingston" and the "Rich-

mond," both of which looked resplendent in decorations of streamers and flags. The boats stopped at West Point, where the party was joined by several officers of that post, the latter being accompanied by the military band.

The day for the festivities was ushered in at Albany by the roar of cannon and the ringing of bells, and during the early hours the people in large numbers were astir. The packet-boat "De Witt Clinton," having on board a committee, proceeded to the junction of the Erie and Champlain canals, where the commissioners, who were descending the former canal, were to be met and escorted to Albany. At the appointed hour the military and civic organizations formed a line and marched to the lock which connected the Erie canal with the Hudson river. All the available space in the immediate neighborhood was thronged with people and an immense crowd congregated along the banks of the canal for several miles.

In the presence of this vast assemblage the aquatic procession, with numerous boats in line and all presenting a beautiful sight with their gay decorations, started on its eventful journey to the last lock, through which these first vessels were to descend into the waters of the Hudson river. The procession was headed by the "De Witt Clinton," which had on board the man in whose honor the boat was named, Governor Yates, the Mayor and other officials of Albany, the canal commissioners and engineers, the committees and other citizens. The flotilla having arrived at 12 o'clock, the "De Witt Clinton" entered the lock, over which a triumphal arch had been erected. Next followed the laying of the coping-stone of the structure with masonic ceremonies. The lock-gates were then opened and the "De Witt Clinton" was allowed to descend into the Hudson, this operation being attended by the booming of artillery and deafening applause by the multitude.

After this part of the ceremony the gentlemen on board the canal boats disembarked and joined the procession, which moved to the capitol, where a spacious pavilion had been built. Here occurred a reception in honor of the several committees and distinguished guests, besides the delivery of a congratulatory address to the canal commissioners by Mayor Dudley, on behalf of the city, to which De Witt Clinton, as president of the board of



Reproduction of an old print, published during the construction of the original Erie canal; design was used also for decorating china.

commissioners, responded. William Bayard, chairman of the New York committee, also conveyed the congratulations of the people of that city to the citizens of Albany, and reply was made by William James, of the committee representing the Capital City. The celebration was closed in the evening with a sumptuous banquet and a pyrotechnic display, making that day a memorable one in the history of Albany.

In November, 1823, there arrived in New York a boat from Hector, at the head of Seneca lake, which attracted considerable attention. She had come by way of Seneca lake and Seneca river, through a private company's locks at Waterloo, from a point seventy miles south of the Erie canal and three hundred and fifty miles from New York. As an indication of the extent and importance of the benefits that would follow the opening of canals into the interior, this event was deemed worthy of notice, and her owners and navigators, two farmers of Tompkins county, were given a public entertainment. As an illustration of home industry this boat was complete. Her owners were her architects and builders; her timbers and cargoes came from the forest and fields near where she was built; her crew was composed of the men who had cultivated her cargo; even her sails and rigging were manufactured by her owners, the materials for them having been grown on their farms.

At the time of beginning the construction of the Erie canal, comparatively little was known of the geological formations occurring in that section of the state through which it was to pass, except in a general way. The enthusiasm of its friends led one of them, Stephen Van Rensselaer, himself a canal commissioner at the time, out of his private liberality to provide for the services of an eminent geologist, Amos Eaton, who, with assistants, in 1822 began a thorough, scientific and connected survey of the rocks lying near the line of the canal, this being the first extended investigation in the state, and, with the exception of one in Albany and Rensselaer counties by Prof. Eaton in 1821-2, under the same patronage, the first in the state. The results* of this survey, which were published in 1824, were of lasting value to the cause of science, and this

*Eaton's *Geological and Agricultural Survey of the District adjoining the Erie Canal*, (1824).

report has become classic in New York geology. The differentiation of the various geological formations, as determined by Prof. Eaton, still has an important value in the classification of the rocks of the state.

In 1824 a portion of the western section remained to be finished before the canal could be navigated from Lake Erie to the Hudson river. The section from Brockport to Lockport was completed sufficiently to admit water, of which the Irondequoit and Oak Orchard creeks contributed the supply. The embankments were porous and the creeks low, but the canal was navigable from Brockport to the foot of the mountain ridge. The excavations at this place had not yet been completed, but the combined locks at the brow of this ridge were nearing completion. The canal commissioners announced this flight of locks as being "of the first magnitude on the line, and one of the greatest of the kind in the world. The superior style in which it is executed—its situation at the brow of a perpendicular precipice of about seventy-six feet, overlooking a capacious natural basin, with banks on each side of an altitude of more than one hundred feet, connected with the deep rock excavation, renders it one of the most interesting points on the Erie canal."⁵⁵

As told elsewhere in this volume, Nathan S. Roberts was the designer and builder of these locks. So important were these structures considered that the attention of all the engineers was called to them. Although Mr. Roberts attained to considerable prominence in his subsequent engineering career, he said that the proudest moment of his life was when his plan for these locks was adopted.

In order to accurately ascertain the amount of freight with which the boats navigating the canals were loaded, so as to insure the collection of the full amount of tolls, two hydrostatic locks were built, one at Utica and the other at Syracuse. They were found to be useful, their utility becoming more and more apparent with the increase of business. Previously all articles had to be separately weighed unless the collectors and boatmen could agree in estimating the weight, and this system caused much vexation and led to deception and fraud. As examples of the ingenuity developed before the day of large scales, they are interesting and

⁵⁵Canal Commissioners' Report, *Senate Journal*, 1825, p. 275.

deserve a brief description. The canal commissioners thus reported concerning them:—

“These hydrostatic locks are constructed with a chamber sufficiently large to receive any boat used on the canals. The chamber is on the same level with the canal, and is filled from it by a paddle gate which is fixed in a large gate. On a level below the chamber is a receptacle, into which, by a gate, the chamber can be emptied, and from this through another gate, the water can be discharged. . . .

“When it is designed to ascertain the weight of a loaded boat, the chamber is first filled . . . the boat is moved from the canal into the chamber, and the gates closed behind it. The depth of the water in the chamber is then carefully ascertained . . . and the cubic contents of the water, with the boat floating in it, is at once obtained from a table constructed for the purpose . . .

“The water is then drawn off into the receptacle, and the boat settles down upon timbers, so arranged as to yield to its shape, by which it is supported, without being strained or injured. The quantity of water drawn from the lock is then ascertained .

. . . It is a principle in hydrostatics, that every body which floats in water, displaces a volume of this fluid, precisely equal in weight to the floating body. It appears from the above, that the water, with the loaded boat floating in it, contained . . . cubic feet, and that the same water, drawn off and measured separately, contained . . . cubic feet, which subtracted from the preceding, will give . . . cubic feet of water displaced by the loaded boat. . . . This is to be reduced to tons, and the weight of the empty boat previously ascertained in the same manner, is to be deducted, and the remainder will be the weight of the cargo. After an empty boat has been once weighed she is numbered, and her weight is registered at the several hydrostatic locks.”⁵⁴

During 1824 the amount of tolls collected was \$294,546.62. In their report of the work for that year the commissioners accord themselves the privilege of predicting future tolls. By a series of calculations they estimated that the Erie canal alone would give an annual revenue of a million dollars, at the end of ten

⁵⁴Canal Commissioners' report, *Senate Journal*, 1825, pp. 280-281.

years from its completion, and that within fifty years the income would amount to more than nine millions. These speculations indicate the optimistic trend of public sentiment, and disclose one of the causes that, within the next few years, led to that wild desire for canals throughout all parts of the state, which has been aptly termed the "canal mania."

On the last day of the legislative session of 1824 there occurred an incident which will ever remain a blot upon the page of early canal history—the removal of De Witt Clinton from the board of canal commissioners. For fourteen years he had been giving unsalaried service as canal commissioner, acting as president of the board for the last eight of these years, and then, without warning and for no reason but to accomplish his political downfall, he was ejected from the office by the Legislature of the State which he had served as Governor for six years. To be sure, Clinton has probably been accorded more than his due credit for the canals, and for many details that should properly be attributed to others—the engineers, the acting canal commissioners and other advocates of the project—and it may be well to glance at that phase of the subject for a moment. There is no evidence to show that he had taken as much interest in the canals as some of the other commissioners up to the fall of 1815, when he wrote the "New York Memorial." During the next winter he was present through the greater part of the legislative session, ostensibly to advance canal legislation, but, when called upon, he was unable to furnish the canal committee with necessary information regarding the contemplated routes, and he departed, leaving the canal measure to its fate, when the prospect for favorable action was very doubtful. In the next year Clinton successfully adopted the canals as an issue on which to wage his contest for the gubernatorial chair. Again, Clinton's writings, especially the pamphlet entitled *The Canal Policy*, show a deplorable tendency to belittle the work of others, to appropriate to himself the greater share of credit for the whole undertaking, even to the point of misrepresenting facts, and to make to appear as a party measure an enterprise that, during its early history, was remarkably free from party limitations.

However, notwithstanding all these facts, to Clinton is due the honor of being the chief advocate of canals during the period of

construction; his was the name associated with their success throughout the civilized world and his would have been the disgrace if they had failed; he had borne the brunt of ridicule and abuse before success was assured. Then, just before the final consummation of this world-famed achievement, this insult of being ignominiously ejected from office was placed upon him, for no reason but because his favorite project had succeeded too well.

Mr. Clinton was supposed to have Presidential aspirations, and his great popularity incited his enemies in the State Senate in 1824 to introduce a resolution for his removal as a canal commissioner, evidently believing that such a course would obstruct his further advancement in the esteem of the people. After a lengthy debate, the resolution was adopted by a vote of twenty-one to three and was immediately sent to the Assembly for concurrence, as the Legislature upon this day was to adjourn *sine die*. In the hurry and bustle incident to adjournment the resolution was rushed through, the vote being sixty-four to thirty-four.

One historian thus describes the scene: "When the announcement was made gentlemen engaged in packing up their papers paused and stared at each other, as if wondering if they had heard aright. Henry Cunningham was in the act of putting on his overcoat, and without a moment for reflection threw it over his arm and turned to the speaker with flashing eyes and face glowing with indignation . . . For what good and honorable purpose has this resolution been sent here for concurrence at the very last moment of the session? . . . Sir, I challenge inquiry. We have spent rising of three months in legislation, and not one word has been dropped intimating a desire or intention to expel that honorable gentleman from the board of canal commissioners! What nefarious and secret design, I ask, is to be effected at the expense of the honor and integrity of this legislature?"⁵⁵

Mr. Clinton took the matter philosophically, as his persecutors could find no official act of his that would cast dishonor upon his name. He simply invited the most rigid scrutiny into his official conduct. Indignation meetings were held throughout the state, at which the Legislators, who were responsible for his removal, were denounced most bitterly. In New York City there

⁵⁵Lamb's *History of New York City*, Vol. II., pp. 688-689.

was intense feeling and on April 20, ten thousand persons assembled in City Hall park for the purpose of denouncing the Legislature and expressing their thanks to Mr. Clinton for his long, able and gratuitous services in the prosecution of the New York canals. When this meeting was opened, the speaker said:

"Who stood forth as the triumphant advocate of the Great Western Canal? . . . Who placed in jeopardy his hold on public confidence and respect? . . . Who, after he became the chief magistrate of this state, identified his administration with this work, and risked its duration on the success of the project? Who aided in obtaining loans for its advancement? . . . Who for nearly ten years had presided over the board of canal commissioners? Who had waded through streams and torrents of ridicule, calumny and insult, in the prosecution of this canal? Who, throughout the American union, and who, on the other side of the ocean, was connected as a leading and efficient personage in this splendid work? Need any man stand here and pause like Brutus among the Romans, for a reply? *De Witt Clinton is the man!* Every tongue utters his name; every heart bears testimony to his services."⁶⁶

As a rebuke for Mr. Clinton's removal as canal commissioner, he was again nominated for Governor in 1824 and re-elected by nearly seventeen thousand majority (large for that time). Public sentiment was overwhelmingly in favor of Mr. Clinton's party, and nearly every man who had contributed to the injury inflicted upon him was swept out of office.

The Legislature had another important subject before it, in 1824, relative to the attempt made by the United States Government to exact tonnage duties on boats navigating the State canals, under the act of Congress of February 18, 1793, and to require such boats to be enrolled and licensed under the United States. The subject aroused much opposition in the Legislature, which received its first notice of the intent of the Government through a letter from Joseph Anderson, Comptroller of the United State treasury. In April of this year the matter was discussed by the House of Representatives, under a proposed amendment to have canal boats exempted from such claim or exaction, but Mr. Newton from the committee on commerce rend-

⁶⁶Hosack's *Memoir of De Witt Clinton*, pp. 470-471.

ered a report which was adverse to amending the law "so as to admit boats to navigate the canals without enrollment or license, or payment of tonnage duties," and the House concurred in the report.

The State Legislature characterized the acts of the United States officials in attempting to impose this tax upon the trade of the canals as unwarranted and unjustifiable, and it passed a resolution requesting the New York State Representatives in Congress "to use their utmost endeavors, to prevent any such oppressive and impolitic exaction for tonnage duties, on boats navigating the canals, from being carried into effect."⁸⁷ General Tallmadge, who introduced the resolution in the Assembly, made an eloquent speech which was responsible for the unanimous adoption, by that body, of the resolution. During his remarks he said:

"The proposition which I maintain is, that whatever may be the language, or however extensive the terms and expressions of the act of 1793, yet, that it cannot be construed to extend to, or include within its operations the canals of this state, and cannot justify the exaction of a tonnage duty upon boats within those canals. . . .

"This construction and restriction of the words of the act of 1793, derives great force from the recollection, that so far from the words of the act being intended to apply to canal navigation, our canals have been made long since the date of the act, and under the scoff and hiss of that general government, which laughed at the folly of our undertaking; but which now comes to search into our internal concerns, and demand of us tribute for our commercial enterprise. Massachusetts has her Middlesex Canal, but we have not heard of a tonnage duty there—Virginia has long had her James River Canal, and yet the letter of the comptroller, nor the report of Mr. Newton, do not tell us that tonnage duty has been for years past collected there. Carolina has a canal through the Dismal Swamp, yet it does not appear any requisition has been made upon it for tonnage duty—while New-York has not even yet completed her great work, the justice and policy of a tonnage duty is already discovered, and the act of 1793 is found to be intended for our canals to be made in 1824, and under

⁸⁷*Assembly Journal*, 1824, p. 1367.

the power to regulate commerce with foreign nations and among the several states, collectors are now in the interior chasing after boats for forfeiture and confiscation. Under such a state of facts, the report of Mr. Newton is made and adopted by Congress."⁵⁸

Governor Clinton, in his message of 1825, alluded to the subject, saying: "I cannot pass over, in silence, the attempt which has been recently made, to bring the boats navigating our canals, within the operation of the statutes for regulating the coasting trade of the United States, by requiring from such boats enrolment and licence, and the payment of tonnage duties. The canals are the property of the state, are within the jurisdiction of the state, have been constructed by the state, and can be destroyed by the state. They have been made at its expense, after the general government had refused all participation and assistance. It cannot well be perceived how the regulation of commerce 'with foreign nations, and among the several states, or with the Indian tribes,' can authorize an interference with vessels prosecuting an inland trade, through artificial channels. The coasting trade is entirely distinct from a trade through our canals, which no state in the union, nor the general government itself, has a right to enjoy, without our consent. The consequences of such assumptions would be, if carried into effect, to annihilate our revenue arising from tolls, to produce the most oppressive measures, to destroy the whole system of internal improvements, and to prostrate the authority of the state governments."⁵⁹

These protests were effectual, for the Federal Government abandoned its attempt to enforce the proposed enrollment and collection of tonnage duties.

At the legislative session in 1825 an act (chapter 277) was passed, directing the canal commissioners to "construct a canal from the point where the Erie canal now intersects the Niagara river opposite Squaw Island along the margin of the river, to a point where the canal from Buffalo now enters the said river near Bird Island, so as to continue and complete the Erie canal to Lake Erie at the mouth of Buffalo creek, distinct from, and independent of, the basin at Black Rock, if in the opinion of the said commissioners such canal may be necessary, either from

⁵⁸Hosack's *Memoir of De Witt Clinton*, pp. 402-403.

⁵⁹*Assembly Journal*, 1825, p. 17.

the accumulation of sand or ice in the said basin, or from any just apprehension that the works of the same may not secure a permanent supply of water for the Erie canal, or if for any other reason the said canal in their opinion may be necessary." Section 3 of the act directed the commissioners to "lay out the said canal along the margin of the said Black Rock basin, as speedily as may be," if they deemed that such a canal was necessary.

The work between Black Rock and Tonawanda creek was completed on June 1, when four feet of water was admitted, permitting navigation from the portage at the mountain ridge to Black Rock. This was extended to Buffalo in August. In order to save the expense of pumping, work was suspended for some time upon a portion of the mountain ridge while a drain could be prepared through the unfinished part, as the line had been inundated. This caused considerable delay and the canal was not completed until October 26.

In the autumn of 1825, as the canal was nearing completion, the common council of the City of New York, at the instigation of many prominent citizens, made arrangements to celebrate the event with such public demonstrations of joy, as a work so great and so beneficial to the State deserved. This celebration was participated in by nearly all of the cities and villages along the line of the waterway from Buffalo to New York. The twenty-sixth of October had been appointed as the date of the celebration, as the canal commissioners had determined that the canal would be ready for navigation on that day. The arrangements provided for fitting demonstrations to be held throughout the state on that day, and also for the starting from Lake Erie of a fleet of boats which was to traverse the whole length of the canal to Albany and then to proceed down the Hudson to New York and on to Sandy Hook, where the ceremony of uniting the waters brought from Lake Erie with those of the Atlantic was to occur.

Early on the morning of the appointed day the village of Buffalo was thronged with people gathered to see the departure of the first boat. At nine o'clock a procession of the various societies of mechanics was formed at the Court House, and proceeded to the head of the canal. Here the Governor of the State,

the Lieutenant-Governor, a committee from the New York common council, and the committees from Buffalo and various other villages embarked on the boat "Seneca Chief,"⁶⁰ which was elegantly fitted for the occasion, and carried among its articles of freight two kegs of Lake Erie water. The "Seneca Chief" headed a flotilla consisting of the boats "Chief," "Superior," "Commodore Perry," and "Buffalo," which was joined by other boats during the journey to the east,—the "Niagara," at Black Rock, and the "Young Lion of the West" at Lockport. Another boat called "Noah's Ark," carried a cargo of "products of the West," which included a bear, two eagles, two fawns, several fish, and two Indian boys. At ten o'clock, as the fleet entered the canal, this event of the embarkation of the first boat from the lakes to the ocean was heralded throughout the length of the state by the firing of cannon stationed at suitable intervals, each of which caught up the message in turn and passed it to its neighbor. Thus was sounded a grand salute, from a battery five hundred miles long, such as the world had never heard before, announcing an event which was equally new in the world's history. The message was carried from Buffalo to New York in an hour and thirty minutes and then returned again to Buffalo. The cannon used at Lockport were those with which Perry conquered upon Lake Erie and the gunner was a lieutenant of Napoleon's army.

The journey to New York was a continuous series of ovations. In the country, the banks were lined with the cheering crowds, and at the gaily decorated villages, the boats were greeted by the firing of cannon or the display of fireworks, while the distinguished passengers, after the interchange of congratulatory speeches, were entertained in a royal manner at banquets and balls. At Lockport, "the spot where the waters were to meet when the last blow was struck," and where "nature had interposed her strongest barrier to the enterprises and the strength of man," the celebration was "such as to do honor to the work." When the grand salute from Buffalo had passed, boats laden with

⁶⁰One of the passengers upon the "Seneca Chief" was Mr. William L. Stone who wrote a graphic description of the whole celebration which he published under the title of *Narrative of the Festivities Observed in Honor of the Completion of the Grand Erie Canal*, etc. From this narrative most of the material for the present account is taken.



THE OPENING OF THE ERIE CANAL.

(Copyright, 1903, C. Y. Turner.)

A mural decoration in the De Witt Clinton High School, New York, illustrating the passage of the first boats from Lake Erie to the Atlantic.

prominent citizens had ascended the flight of locks and proceeded to Pendleton where the fleet was met and escorted back to Lockport. At Rochester the boat called the "Young Lion of the West" was stationed at the entrance to the basin, and upon its approach hailed the "Seneca Chief," and the following dialogue ensued:

"Question.—Who comes there?"

"Answer.—Your Brothers from the west, on the waters of the great Lakes."

"Q.—By what means have they been diverted so far from their natural course?"

"A.—By the channel of the Grand Erie Canal."

"Q.—By whose authority, and by whom, was a work of such magnitude accomplished?"

"A.—By the authority and by the enterprise of the patriotic People of the State of New York."⁶¹

At Syracuse the floating procession was met by a large concourse of citizens, and the address of welcome was delivered by Joshua Forman, who in 1808 had introduced the first resolution in the Legislature relative to the Erie canal. "Judge Forman here joined the committees as a representative from the village of Syracuse to New York."⁶² At Rome was found the first evidence of dissatisfaction. "The proceedings at this place on the twenty-sixth, were of a singular character, partaking of joy and sorrow, of chagrin and satisfaction. It will be remembered that the inhabitants of Rome contended for the location of the canal through their village, instead of the route finally determined on, not so much as a matter of justice to them, as one of expediency and economy. Their hopes were frustrated, and they have never ceased to feel that they have been dealt by unjustly."⁶³ To express their feelings, they formed a procession, and bearing a *black* barrel, filled with water from the old canal, "with muffled drums, they marched to the new canal, into which they poured the contents of the black barrel. They then, in *quick time*, returned to Starr's Hotel, where they put aside their ill humor, and joined with heart and hand in celebrating the

⁶¹*Narrative of the Festivities, etc.*, William L. Stone, printed in Colden's *Memoir*, p. 299. (New York, 1825.)

⁶²*Id.* p. 303.

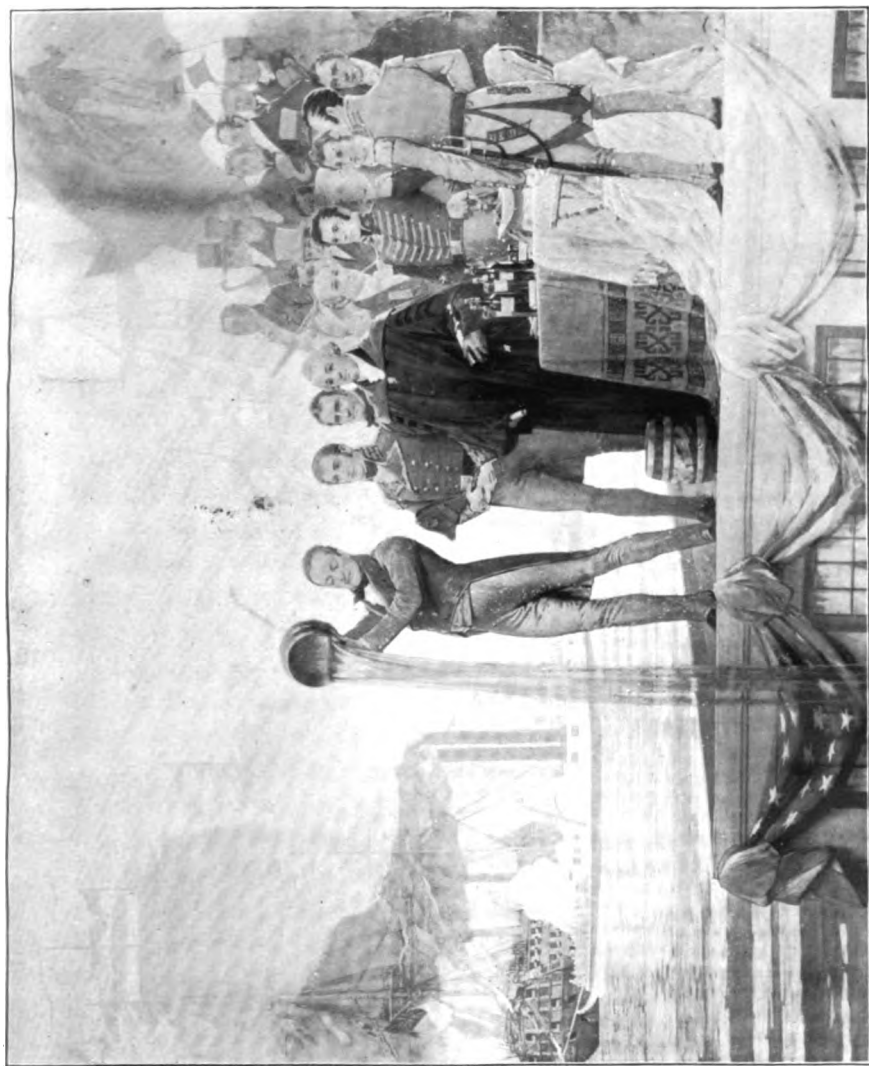
⁶³*Id.* pp. 304-305.

event which had on that day congregated thousands of their fellow-citizens." ⁶² When the boats from the west arrived at Rome, they were received with the usual courtesies. At Utica the company was joined by Judge Platt, "who, by his exertions in the Senate and in the Council of Revision, afforded powerful and efficient aid to the cause of the Canals." ⁶³ Next to the work through the "Mountain Ridge" at Lockport, the construction at Little Falls, where the canal bed was excavated in solid rock, was the most formidable labor executed. Arriving here at night, the flotilla was greeted by bonfires on the impending crags, and the usual addresses and banquet followed. At Schenectady was again displayed a feeling of dissatisfaction. Here had been the terminus of the Mohawk traffic and the beginning of the carry to Albany, and the people of Schenectady looked upon the new canal as a menace to their prosperity. A leading newspaper had proposed a funeral procession, and no preparations for a reception were made. However, the distinguished guests were received respectfully, but without enthusiasm, and conducted to a hotel where dinner was eaten in a sober manner. The "College Guards," formed of students in Union College, rose above the local feeling and partly relieved the solemnity of the occasion, by appearing in handsome uniforms and welcoming the boats by a salute of musketry.

At Albany occurred the most elaborate reception yet encountered, a whole day being spent in the celebration. A procession, which included the Governor and Lieutenant-Governor, Canal Commissioners, Engineers and Assistants, Judicial Officers of the State and Union, Army and Navy Officers, most of the State Officers, military and commercial societies, and many others, proceeded to the Capitol, where appropriate exercises were held in the Assembly chamber. Then they marched to the elaborately decorated bridge over the Hudson, upon which tables had been placed to accommodate six hundred guests.

In the journey down the river the canal boats were taken in tow by steamboats and joined by several more, so that quite a formidable fleet was presented. No stops were made, and a day and a night were consumed in the passage to New York. From

⁶²Stone's *Narrative of the Festivities*, in Colden's *Memoir*, pp. 304-305.



"THE MARRIAGE OF THE WATERS."

(Copyright, 1905, C. Y. Turner.)

A mural decoration in the De Witt Clinton High School, New York, illustrating a scene connected with the ceremony of opening the Erie canal in 1825.

the villages on the banks, salutes were fired by day and fireworks exhibited by night. On the morning of the fourth of November, the passengers awoke opposite New York "to greet the beautiful dawn of a day long to be remembered in the annals of our state and country."

For the final ceremony of uniting the waters of Lake Erie with those of the ocean, the fleet was joined by many superbly decorated boats, forming a naval pageant, which, according to the narrator of the occasion, exceeded in beauty and magnificence any fête which the world had ever witnessed. Arrived off Sandy Hook, the fleet formed a circle and "His Excellency Governor Clinton then proceeded to perform the ceremony of commingling the waters of the Lakes with the Ocean, by pouring a keg of that of Lake Erie into the Atlantic; upon which he delivered the following address:—

"This solemnity, at this place, on the first arrival of vessels from Lake Erie, is intended to indicate and commemorate the navigable communication, which has been accomplished between our Mediterranean Seas and the Atlantic Ocean, in about eight years, to the extent of more than four hundred and twenty-five miles, by the wisdom, public spirit, and energy of the people of the state of New York; and may the God of the Heavens and of the Earth smile most propitiously on this work, and render it subservient to the best interests of the human race." **

To complete the ceremony, and to typify the commerce of New York with all nations, Dr. Samuel L. Mitchell then poured into the ocean bottles of water from various rivers of the world;—the Ganges and Indus of Asia; the Nile and Gambia of Africa; the Thames, Seine, Rhine, Elbe, and Danube of Europe; the Orinoco, La Plata and Amazon of South America; and the Mississippi and Columbia of North America.

On this occasion a toast to the memory of one, who at the time of his death was serving as canal commissioner, fittingly recalled the fact that but eighteen years had passed since the first successful steam navigation. While the steamboats were returning to the city this toast was given, standing—"The memory of ROBERT FULTON, whose mighty genius has enabled us

"Stone's Narrative of the Festivities, in Colden's Memoir, pp. 320-321.

to commemorate this day in a style of unparalleled magnificence and grandeur.”⁸⁸

While these scenes were being enacted upon the water, a procession five miles long, the largest of the kind ever witnessed in America up to that time, had been marching through the streets of the city since ten o'clock in the morning and was at the Battery at half past two to receive the returning fleet. The procession represented all the various societies, industries, and educational institutions of the city. The festivities of this memorable day were closed in the evening by the illumination of public buildings and private residences and by a brilliant display of fireworks. The City Hall, the center of attraction, was lighted by twenty-three hundred lamps and candles, and the pyrotechnic display is described as surpassingly beautiful and never before equaled on this side of the Atlantic. On Monday evening, the seventh of November, the festivities in the city were appropriately concluded by a ball, at which the decorations were described as being particularly handsome and magnificent. “Above the proscenium were the names of the engineers who have been employed in the construction of the Canal, viz.—Briggs, White, Geddes, Wright, Thomas; opposite these, and in the center of the circle of boxes, was a bust of Washington, surrounded with evergreens, and around were inscribed the names of the past and present canal commissioners, Hart, Bouck, Holly, De Witt, North, Livingston, Fulton, Clinton, Van Rensselaer, Morris, Eddy, Young, Seymour, Porter, Ellicott . . . Upon the supper table was placed, floating in its proper element, (the waters of Erie) a miniature canal-boat, made entirely of maple sugar, and presented to Governor Clinton by Colonel Hinman, of Utica.”⁸⁹

When the visitors from the West returned home with their boats, they carried with them water from the ocean in a keg, on which were inscribed the legends: “*Neptune's return to Pan*”, “*New York, 4th Nov. 1825*”, and “*Water of the Atlantic*.” Arrived at Buffalo, the celebration was concluded by pouring these waters from the ocean into Lake Erie. In closing his story, the narrator thus exclaims of the authors and builders of the canal: “Europe begins already to admire—America can

⁸⁸Colden's *Memoir*, p. 288.

⁸⁹*Id.* p. 328.



Large medal struck to commemorate the completion of the Erie canal.
Natural size.

never forget to acknowledge, that THEY HAVE BUILT THE LONGEST CANAL IN THE WORLD IN THE LEAST TIME, WITH THE LEAST EXPERIENCE, FOR THE LEAST MONEY, AND TO THE GREATEST PUBLIC BENEFIT." 67

In commemoration of the completion of the canal, medals of white metal were struck and sent to the invited guests at the celebration, to the committees from cities and villages along the canal, to colleges, historical societies and to many others. Silver medals were sent to Federal, State and Army officers and other distinguished citizens. Gold medals were sent to the family of George Washington, to the three surviving signers of the Declaration of Independence, to La Fayette, the last surviving Major-General of the Army of the Revolution, to the senior officer then living of the Navy of the Revolution, to the President and ex-Presidents of the United States, and to the family of Robert Fulton.

Thomas Jefferson's reply, upon receiving this medal, is worthy of notice in comparison with the doubts he expressed at the beginning of the canal. His letter was written on June 8, 1826, less than a month before the day when he and John Adams, two of the three surviving signers of the Declaration of Independence, died on the fiftieth anniversary of the adoption of that historic document. He said:

"This great work will immortalize the present authorities of New York, will bless their descendants with wealth and prosperity, and prove to mankind the superior wisdom of employing the resources of industry in works of improvement." 68

It will be remembered that Madison had objected to giving National aid at the beginning of the enterprise. In his reply acknowledging the receipt of the medal he said:

"As a monument of public spirit conducted by enlightened Councils, as an example to other States worthy of emulating enterprise, and as itself a precious contribution to the happy result to our country of facilitated communications and intermingled interests, bringing nearer and binding faster the multiplying parts of the expanding whole, the Canal which unites the

⁶⁷Stone's *Narrative of the Festivities*, in Colden's *Memoir*, p. 331.

⁶⁸Facsimile letter accompanying Colden's *Memoir*.

great Western lakes with the Atlantic ocean, is an achievement of which the State of New York may at all times be proud, and which well merited the homage so aptly paid to it by her great commercial Metropolis." ⁶⁹

James Monroe said, "The accomplishment of the great work, undertaken by the State of New York, by which the western lakes are united with the Atlantic ocean, through the Hudson river, forms a very important epoch in the history of our great republic. By facilitating the intercourse and promoting the prosperity and welfare of the whole, it will bind us more closely together, and thereby give a new and powerful support, to our free and most excellent system of government." ⁷⁰

John Quincy Adams said that it was "an Event among those most worthy of commemoration, in the progress of human Affairs—an Event equally creditable to the enterprize and Perseverance of the People of New York; and by the accomplishment of which, in honouring themselves they have reflected honour upon the age and country to which they belong." ⁷¹

⁶⁹ ⁷⁰ ⁷¹Facsimile letters accompany Colden's *Memoir*.



Keg carrying water from Lake Erie to the Atlantic, used in the ceremony of opening the Erie canal; keg in possession of the Historical Society of New York City; photograph furnished through courtesy of Society.



Small medal struck to commemorate the completion of the Erie canal.
Natural size.

CHAPTER III.

ENLARGING THE ERIE.

From the formal opening of the original canal to the completion of the first enlargement.

The period from 1825 to 1834 was a time of development for the Erie canal, during which no radical changes were made, and the improvements undertaken were such as to add to the permanency and stability of the canal. Succeeding this period came the first enlargement of the Erie, which was not completed until 1862. After the opening of the canal in 1825, traffic had increased by leaps and bounds, and the revenue collected from tolls demonstrated the wisdom of the builders and presaged unbounded prosperity for the future. From 1826 to 1834 the aggregate tolls amounted to \$8,539,377.70. Indeed, so marked was the success of the Erie that a veritable frenzy for canal-building spread over the whole country, which manifested itself in New York State in a flood of petitions to the Legislature for the opening of waterways, in the surveys of hundreds of miles of proposed routes, in the building of several unremunerative and—in the light of later history—ill-advised lateral branches and in the incorporation of more than sixty private canal companies. One act alone, the “great canal law” of 1825 (chapter 236), ordered the surveys of seventeen contemplated canals, covering a distance of over twelve hundred miles, and many other surveys were made later. Within the first decade after the completion of the Erie, six canals were built, having a length of two hundred and ten miles, and during the next four years four more, with a length of two hundred and forty miles, were authorized. These, together with the five hundred miles embraced in the original Erie and Champlain, the navigable feeders and later laterals, and the one hundred and five miles of canals built by two private companies, made an aggregate of about ten hundred and sixty miles constructed in the state.

After the opening of the canal, one of the first troubles experienced came from the rapid movements of packet and light freight boats, which were having a destructive effect on the banks of the canal by driving the water along the face of the banks, washing them away, and depositing the earth in the bottom. These boats also had the right of way in passing locks—another cause of dissatisfaction among boatmen—so that it was attempted to reduce their number to two daily, and in the course of time to abolish them entirely, for upon investigation it was found that the revenue collected from these packets amounted to about one-twentieth of that collected from the freighters.¹ The sides of the prism were repaired by building a slope wall of stone in some places and of wood in others; the banks were also raised in places. Up to 1828 about two hundred and fifty miles of canal had been protected in this way, at a cost of about \$1,600 per mile, where both banks were walled. As early as 1822 it had been found necessary to enact a law (chapter 274), to limit the speed of boats to four miles an hour.

In numerous places it was found that the locks had settled somewhat and needed to be replaced. In several instances it was considered that two locks would soon be useful, if not necessary, in facilitating the increasing business of the canal, and that the loss and inconvenience to the public by stopping navigation at these places, while repairs were in progress, would be greater than the cost of another lock. Therefore, whenever it became necessary to rebuild the structures, a lock was constructed adjoining the old one and after its opening repairs were made to the old lock without in any way interfering with navigation.

During this period the feeder from Limestone creek was completed (1826), and a feeder from the Mohawk river at Rome was constructed (1826). Stone waste-weirs were built and guard-locks were altered and improved. Nearly all the bridges were raised and repaired, and ditches were cut to receive the water leaking from the canal. In 1827 a new lift-lock at Fort Plain was finished, and the dam at the head of the Genesee river feeder was raised fourteen inches. In 1828 two new weigh-locks were built to replace the hydrostatic locks at Syracuse and Troy, and in 1829 another was completed at Utica. In the spring of 1832 a

¹*Assembly Documents*, 1830, No. 183, p. 2.

large break occurred in the canal embankment near the village of Perrinton, and being of great size, it interrupted navigation for a considerable time. To guard against a repetition of this occurrence, and to avoid the necessity of such expensive repairs in the future, several new and larger waste-weirs, together with new guard-locks, were built.

In 1833 a considerable amount of repairing was done, a large percentage of it being caused by the heavy freshets in the Mohawk river. The aqueducts across Oriskany, Butternut and Oneida creeks had to be repaired, having been built of soft and porous stone that could not withstand the climatic changes to which it was exposed. The aqueduct across Mud creek had to be partially rebuilt, and while this was being done the trunk was widened to admit the passage of two boats. It was at this time (1833) that the tolls were reduced $28\frac{1}{2}$ per cent, going to tide-water, and $14\frac{1}{4}$ per cent, going from tide-water. In this year also the number of acting canal commissioners was increased from two to three.

In 1834 came the first step toward an enlarged canal. The canal commissioners submitted a special report² to the Legislature in relation to rebuilding the aqueduct at Rochester, taking an additional feeder into the Erie canal at Camillus on the Jordan level and doubling the locks upon the Erie canal east of the village of Syracuse. Traffic had increased so rapidly and the crowding of boats, especially on the eastern section, had become so great as to demand some relief. The commissioners, therefore, suggested the doubling of locks as a possible remedy. In speaking of this in 1851, State Engineer Seymour said: "As early as 1832, the project of doubling the locks on the Eastern division began to be a subject of conversation. In 1834 the Canal Commissioners made a special report to the Legislature . . . *the first official allusion* to the necessity of enlargement."³ However, as early as 1825 the canal commissioners had perceived the need of greater facilities and in their report to the Legislature on March 4, of that year, had suggested the propriety of doubling the locks. As the construction of double locks appeared extremely difficult at some points, they "presumed that the experience of two or

²*Assembly Documents*, 1834, No. 88.

³*Assembly Documents*, 1851, No. 45, p. 10.

three years more, [would] satisfy the public, that it [would] be proper to commence the construction of another canal parallel with the eastern section," proposing a location on the north side of the Mohawk between Utica and Schenectady.

The commissioners reported that during the season of 1833 it had been shown that the lock west of Schenectady had made more than twenty thousand lockages. They thought that with double locks the canal would be able for some time to accommodate the traffic and still continue to employ boats of the tonnage then in use. Because, from its position, boats could not so readily enter, pass through and clear from the barge lock as the towing-path lock, they thought it probable that forty thousand lockages would be found to approach the greatest number that could be made with double locks in a single season. However, they believed that, within no remote period after the locks could be doubled, the increased transportation would equal if not surpass the capacity of the locks to accommodate it. To meet this need, the commissioners thought that the locks must be extended and the canal enlarged. Accordingly, they recommended that the new locks should be built ten feet longer than the existing structures.

Governor William L. Marcy, in his annual message to the Legislature of 1834, called attention to the phenomenal increase of western settlement and its existing and future requirements for transportation, saying: "If our canals are to be what a wise management cannot fail to make them—the principal channels for this trade—we must calculate its extent, and make them adequate to this object." But New York State, he continued, could not be expected to enjoy the benefits of the western trade without effort, as other Atlantic states were making powerful efforts to remove the natural barriers which hindered their competition for this prize. Canal traffic was always to be increased by bettering facilities of transportation and reducing expenses. By enlarging the capacity of the Erie canal the cost of transportation would be diminished. Tolls were a large factor in this, he said, and had been carefully and judiciously modified by the canal board during the preceding year, with the result of more widely diffusing the trade throughout the West and Southwest. A substantial reduction had been made for the season of 1833, yet, notwithstanding this, the Erie and Champlain canals had received

in tolls \$1,464,259.98, an increase of \$234,776.51 over the year before.⁴

Appreciating the importance of this subject, the Legislature passed an act,⁵ which authorized the commissioners to build double locks between Albany and Syracuse of such dimensions as they deemed proper. This law also directed the taking of Nine Mile creek as a feeder into the Jordan level, the reconstruction of the Rochester aqueduct and the building of sluices around locks on any State canal. As a preliminary step the commissioners employed Mr. Holmes Hutchinson to examine the sites for double locks and to furnish the proper plans and estimates for their construction, and also for the construction of such works as would be proper to adapt the canal to the use of such locks.

In rendering their report,⁶ the commissioners said that, from a careful consideration of the provisions of the act, it was apparent that the Legislature designed to give to the canal and its locks sufficient capacity for whatever transportation the country might require in the future. With the existing capacity of the canal, the section west of Syracuse furnished ample accommodation, and would for some time, but on the eastern section the want of adequate facilities was acutely felt and the crowding was rapidly increasing. In studying the problem of locating double locks, the commissioners considered the subject under three heads: first, what capacity should be given to the canal and locks east of Syracuse, and in what manner it should be afforded; second, what course should be adopted to afford sufficient capacity to the short reaches between some of the locks; third, what should be the lateral distance between the double locks and what their relative location.

In reference to increasing the capacity of the canal by doubling the locks, two methods were suggested—by simply placing two locks side by side, and by building a second towing-path in addition to the double locks. By increasing the width of the canal for the free passage of four boats, and constructing a towing-path on the berme side, each lock would then be able to perform with equal advantage and no change would be necessary in the old locks. This course, however, was subject to great and in-

⁴*Governor's Annual Message*, 1834.

⁵*Laws of 1834*, chapter 312.

⁶*Assembly Documents*, 1835, No. 143.

superable objections; no boats could lie at rest in the canal for loading, unloading or any other purpose; all wharves, basins and slips would have to be made by cuts through the towing-path and the path would consist of a succession of bridges over these cuts. Without adding to the depth of water in the canal or the length of locks, the tonnage of boats could not be increased. It was not supposed that twice the number of boats could as conveniently be passed on the canal with double locks and with one towing-path, as were formerly passed with single locks and with one towing-path. When twice the capacity of the existing canal was reached, the double locks would have attained their utmost limit, and the commissioners believed, as they had a year earlier, that forty thousand lockages per season approximated the maximum capacity of double locks with a single towing-path. They estimated that this limit would be exceeded within eight or ten years, and that within a shorter period the locks would be unable to accommodate traffic during the busiest part of the season. Accordingly, they considered that a widened and deepened channel and enlarged locks were indispensable, if such ample provision for transportation were to be made as was evidently contemplated by the Legislature.

In regard to the short levels, or pound-reaches, the commissioners considered it desirable that water drawn from or thrown into a level at any single locking should not change its water-line more than six inches. They thought that the most advantageous arrangement was to change the locations of the locks so as to make the length of each level at least three and a half boat lengths, and to make the canal wide enough at these reaches to afford the necessary water for locking without injurious change in the level. The proper lateral distance between locks was determined to be twenty-six feet. This would afford space for the regulating or feeding sluice between the lock walls and would require that the canal above and below the locks should be excavated to the width of about seventy-six feet. Believing that the provisions of the law of 1834 were inadequate to satisfy the impending needs, the canal commissioners did no more than cause surveys to be made, submitting their report to the Assembly on January 31, 1835, thus giving the Legislature a chance to reconsider its action of the preceding year.

During the whole period of the first enlargement of the Erie, the canal policy was so closely connected with the financial condition of the State that a clear appreciation of the one is needed to fully understand the other. Indeed, the financial situation in 1845, which largely induced the Constitutional Convention of 1846, was almost entirely due to the canal policy. The history of this entire period is, in fact, as largely one of finance as of engineering or of constructive operations. It is accordingly proper, before considering further the progress of the events which led to the work of construction, to review briefly the situation.

In his annual message of 1833, Governor Marcy gave a concise summary of the State's financial history for the past two decades. He said: "The general fund is almost exhausted, by the liberal contributions it has yielded to all the other funds, by the payment of the State debts, and by furnishing, unaided for the last five years, all the means for the ordinary and extraordinary expenses of the government. The revenue from this fund has at no time been sufficient, without the avails of a general tax, to satisfy the demands upon the treasury. In order to meet these demands, and to relieve our fiscal affairs from embarrassments, it became necessary, in eighteen hundred and fourteen, to impose a tax of two mills on each dollar of the valuation of real and personal property in the State. This tax was continued until eighteen hundred and eighteen, then it was reduced to one mill; in eighteen hundred and twenty-four, to half a mill, and in eighteen hundred and twenty-seven it was wholly discontinued. When the Legislature refused to continue the tax it was well understood that the general fund could not long sustain the burden cast upon it; that its capital would be rapidly reduced, and soon exhausted. Though this event has not approached so rapidly as was anticipated, it is now at hand, and this session should not, in my judgment, be permitted to pass away without providing the means, by the adoption of some settled plan, to satisfy the demands that must inevitably be made upon the treasury. . . .

"The canals are rapidly accumulating the means for the extinguishment of the debt for which their income is hypothecated. When this object is accomplished, the tolls may, with fair claims of justice, be resorted to, for the means of replenishing the

treasury, to an amount, at least, equal to the sum abstracted, for the benefit of the canals, from the general fund.”⁷

With reference to the method of securing funds, the Governor asks: “Shall we then . . . accumulate a debt for the ordinary expenses of the government, trusting to the future appropriations of the income of the canals, for its repayment? . . .

“Whether a resort to a general tax, moderate in amount, in order to provide the means to meet the exigencies of the government, shall be forborne, and a reliance be placed on the chance of deriving sufficient aid for that purpose from the duties on salt, and auction sales; or a debt shall be contracted, with a view to its redemption from the canal revenue, after it is relieved from its present hypothecation, are questions which may with propriety be left to the immediate representatives of the people. If upon due deliberation, you should determine to levy a tax, and leave the other revenues unanticipated and unimpaired, . . . I feel the fullest confidence that the people will cheerfully acquiesce in the decision.”⁸

It must be remembered that Governor Marcy was Comptroller in 1827, when the levying of taxes was discontinued, and that at that time he disapproved of the new policy, and remained later, during his occupancy of the gubernatorial office, an advocate of taxes. But popular sentiment was opposed to taxes and they were resorted to in 1842 only as a temporary relief from the exigencies that confronted an almost depleted treasury.

As we consider the subsequent history of this canal improvement, it should be observed how the Legislature, in spite of Governor Marcy's warnings, proceeded to authorize the enlargement of the Erie and the construction of the Black River and Genesee Valley canals, together with various works upon other lateral branches and a loan of \$3,000,000 to the New York and Lake Erie railroad, without any adequate financial plan, trusting to the canal tolls and the salt and auction duties to maintain the waterways and to pay the expenses of the government and the cost of these improvements. When it was seen how slowly the public work must proceed under this plan, the Legislature, in 1838, sanctioned loans, but failed to provide a means for pay-

⁷*Assembly Documents*, 1833, No. 2, pp. 10-12.

⁸*Id.* pp. 12-14.

ing even the interest, except by the over-burdened canal tolls or by other loans. Of course such a system could not long survive, and in 1842, aided by a general financial depression of a few years earlier, the limit was reached and it became necessary to enact a law which should "provide for paying the debt and preserving the credit of the State" by imposing a tax and by abruptly stopping all public improvements. These experiences taught the people to restrict the power of the Legislature by what has been aptly termed a "new Bill of Rights." This was done in the Constitution of 1846 by the article which required all appropriations of over a million dollars to be submitted to popular vote. After this revised Constitution had attempted to readjust and regulate the financial situation, new troubles arose, which only another amendment in 1854 could remedy. Indeed, from the beginning even to the end of the work in 1862, the lack of funds retarded the enterprise, so that operations were prolonged through a period of twenty-six years, whereas a quarter of that time was probably ample for the whole undertaking, if sufficient funds had been available. For constructing the original canal and for the second and third enlargements, financial schemes were adopted which authorized loans and provided for the payment of both the interest and the maturing principal, but during the first enlargement the very success of the canal seemed to militate against it, for so optimistic a view was entertained that dependence was placed upon the tolls to carry a greater burden than they could sustain. In this connection the arraignment by Governor Young, in 1848, of former Legislatures for their neglect to properly finance the undertaking, is noteworthy. All of these circumstances will be found recorded in their regular sequence. It should be noticed also how rapidly traffic upon the canals increased during this period, with but few backward strides, despite the lack of suitable facilities for transportation.

Still, it is not strange that the people of that day so thoroughly trusted the canals to pay for large improvements, as well as to help defray the expenses of the government, for the canals had succeeded far beyond their expectations. In 1825 the canal commissioners had allowed themselves to make some extravagant predictions, estimating what the tolls on the Erie might be for each year until 1836 and at the ends of the two succeeding decades.

They placed the sum at one million dollars for 1836; two millions by 1846, four millions by 1856, and nine millions within fifty years. Thus far the tolls had exceeded this estimate for every year, and the prospects were bright for even a greater increase in the immediate future. Incidentally it may be remarked that in 1836 the tolls surpassed the prediction by four hundred and forty thousand dollars and in 1846 by almost half a million. With the comparatively limited expenses of the State government at that time, and the relatively large income from the canals, the people had begun to think that taxes need never be imposed again, for the waterways were looked upon as a veritable treasure-house for supplying funds.

The Governor's message to the Legislature of 1835 is worthy of notice, inasmuch as it sounded another unheeded note of warning against embarking on so great a scheme of improvement without an adequate financial plan. The Governor said that he regretted that the provision which had been made by the Legislature for doubling the locks on the Erie canal between Albany and Syracuse had not been accompanied by another almost equally necessary, providing for the enlargement of the capacity of the canal, as he deemed it important that the new locks should be made with reference to this latter improvement. However, the new locks were not then constructed and the matter was left to the consideration of the Legislature.

The Governor explained that the State was then facing either a loan, which was objectionable, or a direct tax for general expenses, as the general fund, though not originally intended for that purpose, had been used for several years, without being reinforced by the proceeds of taxation, not only for general expenses, but for large appropriations for deficiencies in maintaining the lateral canals, for draining the Cayuga marshes and the like. Not only was this the case, but specific sources of revenue, like the auction and salt duties, had been constitutionally pledged to the canal fund and had contributed to it more than five million dollars. The burden of supplying the deficiency in the revenues of the lateral canals from year to year, he declared, showed the wisdom of our original system of internal improvements and the effect of such a departure from it, and admonished us of the necessity of returning to it. "No government," he said, "that had a

proper regard for its public credit or its permanent prosperity, ever contracted a public debt without providing a revenue for the payment of the interest at least, if not for its final extinguishment; and none that neglects to make such a provision, but supplies its necessities, whether ordinary or extraordinary, by loans, and provides for the interest on them by new loans, can long prosecute successfully public enterprises requiring large expenditures. I therefore deem it essential to the success of the system of internal improvements, that you should in some way provide adequate means for paying the interest on the public debt that must be incurred by its further prosecution.”⁹

Again he said: “I do not indulge the expectation that so unwise a course will be taken as to supply the means required for these purposes, by loans, without creating some special fund to pay the debt that will be thus contracted.”¹⁰ But despite this warning, subsequent Legislatures persisted in pursuing this very course.

However, as showing the continued prosperity of the canals, which warranted the expenditure of large sums for improvement, the Governor stated that the income from all the canals and the canal fund for the fiscal year of 1834 was \$1,813,418.73. The whole canal debt was then \$7,034,999.68, of which \$4,934,652.68 was the unpaid balance of the debt created for the construction of the Erie and Champlain canals. For the payment of the balance, funds had accumulated to the amount of \$3,002,576.30. The Erie and Champlain canal fund had yielded a revenue during the last fiscal year, beyond all the charges upon it, of \$1,035,664.92; the tolls alone exceeded these charges by \$587,850.61. Although the tolls had again been reduced in January, 1834, on merchandise and food-stuffs, the income from the Erie and Champlain canals from these sources alone was \$1,313,155.84 for the fiscal year. The tolls of the same year were only \$11,265.79 less than those of the previous year. The business on the Erie and Champlain canals had, therefore, increased nearly in the ratio of the reduction of tolls.¹¹

The improvement of the canal was generally conceded to be a necessity, but opinions widely differed concerning the proper

⁹*Assembly Documents*, 1835, No. 2, Governor's Annual Message, p. 13.

¹⁰*Id.* p. 10.

¹¹*Id.* pp. 8, 10 and 11.

policy to pursue. The sentiment favoring enlargement was no ill-advised, speculative effort, but rather a business-like, earnest movement to benefit the people of the whole state and country by providing a waterway capable of transporting through the state, expeditiously, economically and safely, all the products of agriculture and manufacturing that could be secured for that route. The structures on the canal had largely become impaired and a number would necessarily have to be rebuilt and it was deemed wisest to construct on an enlarged plan and for the prospective traffic rather than to build on the dimensions that were thought sufficiently large at the time of beginning the original canal. At this time every indication pointed to a rapid increase in canal traffic. A glance at the chapter treating of the influence of the canal will show how the prophecies of the projectors had been more than fulfilled,—in the volume of commerce, the prevalence of general prosperity, the increase of population and the development of western territory.

Two subjects then before the public had a marked bearing on canal enlargement. Of first importance was the growing evidence that railroads were fast becoming a factor in the question of transportation and might soon prove to be dangerous rivals of the canals. Even then those most enthusiastically in favor of railways predicted that they would supersede canals, and advocated the plan of "converting the Erie canal into a railroad."¹² The second subject was a project for a ship canal between Lake Ontario and the Hudson. Both of these matters received legislative notice during the session of 1835, and were the subjects of Assembly resolutions calling for investigations by canal officials.

The Erie railroad enterprise was then before the Legislature, and wishing to learn the comparative advantages of canals and railroads, the Assembly, on February 23, 1835, addressed a resolution to the canal commissioners, requesting a report on the relative cost of construction and maintenance of canals and railroads, the relative charges for transportation and an enumeration of articles that could be better carried by rail than by water. The commissioners selected the engineers, John B. Jervis, Holmes Hutchinson and Frederick C. Mills, to investi-

¹²*Assembly Documents*, 1835, No. 296, p. 2.

gate the subject, and in submitting their report to the Assembly on March 14, 1835, they said:

"It is believed that it will not be difficult to shew, that the expense of transportation on rail-roads, is very materially greater than on canals. In addition to this, there are other important considerations in favor of canals.

"A canal may be compared to a common highway, upon which every man can be the carrier of his own property, and therefore creates the most active competition, which serves to reduce the expense of transportation to the lowest rates. The farmer, the merchant, and the manufacturer can avail themselves of the advantage of carrying their property to market, in a manner which will best comport with their interest."¹³

In summarizing their report, the engineers declared their opinion that canals in general had decided advantages over railroads, saying:

"We may, however, be permitted to state, what appears conclusive from the facts presented, that canals, on the average, have thus far, cost less than rail-roads, both in their construction and repairs.

"In regard to their relative matters as affording the means of transportation, . . . we find the relative cost of conveyance is, as 4.375 to 1, a little over four and one-third to one, in favor of canals: this is exclusive of tolls or profits."¹⁴

Public sentiment, which demanded that some improvement in water communications be made, was reflected in an Assembly resolution on March 4, 1835, which referred to the consideration of the canal board the proceedings of a public meeting held in Utica on February 5, preceding, to take measures to effect the construction of a ship canal between Lake Ontario and the Hudson, also the resolution of the common council of New York in favor of this canal, together with the report¹⁵ of an engineer, E. F. Johnson, on this project. People were becoming alarmed lest, by the failure of the State to provide adequate means for transportation, other routes would secure the traffic,—as the memorial prepared at the Utica meeting expressed it, saying,

¹³*Assembly Documents*, 1835, No. 296, p. 2.

¹⁴*Id.* p. 42.

¹⁵*Assembly Documents*, 1835, No. 195.

"the States of Pennsylvania, Maryland and Virginia, and especially the Provinces of Canada, are making strenuous exertions to divert the trade of this important region through their own territories, and to their own markets," which "render it the imperative duty of the representatives of the people of this State early to undertake, and vigorously to prosecute, such a system of internal improvement as shall promise the most certain success in this generous contest with their enterprising neighbors."¹⁶ In addition, the memorialists said: "The Erie canal, in its present state, will be unable to accommodate any material increase of business; and . . . unless some adequate measures are adopted by the Legislature to secure to this State the advantages of the rapidly increasing trade of the western country, it will seek other channels of transportation and a different market, to the great prejudice of our commercial metropolis, and the loss of revenue and other incidental advantages derived from the passage of that trade through our own internal communications. . . . The plan of doubling the locks, recently adopted on a portion of the Erie canal, though it will doubtless increase its capacity, will afford but a temporary relief; and before that measure can be completed, the steady increase of the business will be found to have kept pace with the increased facilities which will be thus afforded; presenting to us the same alternative which now exists, of creating additional channels, or of yielding to others the benefit of the trade in question."¹⁷

In reporting the results of their investigations on this subject, the members of the canal board conceded that some measures should be adopted to provide for the increased traffic, but disagreed with the Utica memorialists in thinking that a ship canal for either sailing craft or steamboats would be best adapted to meet this need. The difficulty of bridging such a canal seemed insuperable. The fact that steamboats had not yet superseded sailing vessels in carrying property on the lakes led the members of the board to believe that they were not destined so to supersede that kind of boat for the transit of property on lakes or rivers adapted for the use of both, they having been informed

¹⁶*Assembly Documents*, 1835, No. 158, pp. 8-9.

¹⁷*Id.* pp. 7-8.

"by gentlemen of intelligence and experience in lake navigation, that it would be 'impracticable as a regular business for steam-boats on the lakes, to tow vessels with safety, unless the vessels were fitted with masts and rigging and sufficiently manned to be conducted by sails in a storm.'"¹⁸

The report of the board's engineers, Messrs. Jervis, Hutchinson and Mills, further emphasizes the fact that steam propulsion was not sufficiently developed to be serviceable on contracted channels, and that the cost of carriage by steamboats was not favorably comparable with the rate by ordinary canal-boats, even after the charge for a transshipment had been added. They conclude: "We are of opinion, a canal, designed for boats exclusively adapted to its navigation, and which may be towed by steam-boats on the Hudson, will best accommodate the prominent interest involved in the great trade, for which provision is to be made."¹⁹

In their report the members of the board take occasion to express their views on the proper course for the State to pursue, saying: "The canal board entertain the opinion, that an enlargement of the Erie canal would be, in all respects, the best plan to accommodate the transportation between the Hudson river and the western lakes. . . ."

"At the last session of the Legislature a law was passed, directing the Canal Commissioners to double the locks, from Albany to Syracuse. This measure will increase the capacity of the canal, and accommodate the trade for a short period of time, but will not sensibly lessen the expense of transportation. It is however quite certain, that the time is not very distant when additional facilities will be necessary; and the Canal Board take this occasion to express the opinion, that the enlargement of the Erie canal should be directed at the present session of the Legislature."²⁰

The result of this agitation was the passage of a law (chapter 274), on May 11, 1835, which authorized the canal commissioners to enlarge the Erie canal and to construct a double set of lift-locks, as soon as the canal board believed that public interest

¹⁸*Assembly Documents*, 1835, No. 334, p. 4.

¹⁹*Id.* p. 22.

²⁰*Id.* p. 6.

required such improvement. The questions of dimensions and of constructing an independent canal through cities and villages, instead of enlarging the existing works, were left to the determination of the canal board. At a meeting on July 3, 1835, the canal board adopted resolutions declaring that the work of doubling locks and of enlarging the canal should be commenced without delay, and that surveys should be started immediately. The canal commissioners, meeting at Utica on July 17, 1835, determined what considerations should govern the surveys for an enlarged canal. Estimates of cost were to be made for enlarging the prism to six feet depth of water and sixty feet width at water-surface, and also for a canal seven feet deep and seventy feet wide, except at difficult and expensive points, such as perpendicular bluffs or marshes, where the width could be limited to fifty feet. A study of additional water-supply was to be made, with a report on the formation of new feeders and reservoirs, and the engineers were asked to report also on the expediency of two separate canals in villages and cities where widening would cause the removal of buildings at considerable expense, and their opinions were desired in regard to the dimensions of locks best adapted to economy in transportation, for both sizes of enlarged canal.

The engineers in charge of these surveys and the territory covered by each, were as follows: John B. Jervis, from Albany to Fultonville; Nathan S. Roberts, from Fultonville to Frankfort; Frederick C. Mills, from Frankfort to Lyons; and Holmes Hutchinson from Lyons to Buffalo. The reports²¹ of the engineers were submitted to the canal board on October 20, 1835, with estimates of the cost of contemplated improvements on both plans of enlargement, and of all the feeders and reservoirs required.

The reports treated at length of the size of aqueducts, the size of new locks and the dimensions of the improved canal, with carefully prepared recommendations on each. Mr. Jervis advised that the trunks of aqueducts be made fifty feet wide, with spans of eighteen feet between piers; that the locks be one hundred and ten feet long between quoins and sixteen feet wide, being placed in pairs, side by side, forty feet apart from

²¹*Assembly Documents*, 1836, No. 99.

center to center. He estimated that for favorable traction the old canal was adapted to a boat of thirty-one tons, a six-foot canal to one of seventy-one tons and a seven-foot canal to one of one hundred and three tons. He advised a seven-foot canal with seventy feet top width, showing that a seven-foot channel would require thirty-seven per cent more water than the old canal. Mr. Roberts favored a lock one hundred and ten feet between quoins and seventeen feet wide, and a canal six and one-half feet deep and seventy feet wide. Mr. Mills submitted plans of bridges for a seventy-foot canal in the type of the lattice Town. He estimated locks one hundred and ten feet long and sixteen feet wide. In relation to the water-supply for the eighty-five miles included in his section, he estimated that the old Erie required 13,755 cubic feet per minute, that 21,644 cubic feet would be needed for a six-foot depth and 25,147 cubic feet for a seven-foot canal. The report of Mr. Hutchinson gave complete specifications for the manner of constructing double enlarged locks, the basis for the specifications subsequently used in the construction. For the enlarged canal he advised forty-two feet bottom width, seventy feet top width and seven feet depth; locks one hundred and fifteen feet by seventeen feet; size of boats, one hundred and three feet long, sixteen feet wide and five feet draught, with a tonnage of one hundred and sixty-nine tons, exclusive of boat; cost of transportation, he estimated, would be one-half that by the old canal or, more exactly, as 0.54 to 1. The aggregate of the estimates, including the cost of a double set of lift-locks on the whole line, was: for the larger canal, \$12,416,150.17; and for the smaller canal, \$10,368,331.48.²²

To decide the dimensions to which the canal and locks should be enlarged was a question of so great responsibility, and one concerning which there was such a diversity of opinion, that the canal board felt that it must be dealt with most carefully. To change the boundaries of the canal necessitated the interference with private property, and the officials appeared to view this as a very delicate question, and they hesitated before making their decision, considering that the idea of disturbing the bounds of the canal for a second enlargement could not be entertained.

²²*Assembly Documents*, 1836, No. 98, p. 5.

After carefully weighing all of the information derived from the surveys and from other sources, the board decided that the canal should be enlarged to seven feet depth of water and seventy feet width of surface, and that the locks should be one hundred and ten feet long between the quoins and eighteen feet wide. As it was estimated that the enlargement of the canal would lessen the expense of transportation, exclusive of tolls, about fifty per cent, the board deemed it necessary to commence the work as soon as practicable, and to prosecute it with as much diligence as the funds appropriated to this object would admit.

The law authorizing the enlargement provided that the cost of constructing and maintaining the work should be paid out of any monies which might be on hand belonging to the Erie and Champlain canal fund. The funds at the disposal of the canal commissioners were too limited to justify a commencement of work on every part of the canal. It was, therefore, deemed advisable to confine operations to the line between Albany and Syracuse, until such time as the funds would justify a beginning on the other parts of the route. This arrangement would relieve the greatest crowding and thus, in a large measure, secure the advantages of an enlarged canal before the whole could be completed.

In his message to the Legislature of 1836, Governor Marcy reiterated his warning against endeavoring to carry on public works without an adequate financial plan, but this, like his former plea, passed unheeded. He said: "I have not been without apprehensions, and I still entertain them, that internal improvements cannot be long prosecuted on an extensive scale unless sustained by a wise system of finance. No new work can be executed without using the public credit, and however high that credit is at this time, it cannot be liberally used and long upheld without some financial arrangement that will inspire confidence at home and abroad. . . . The improvident practice of borrowing money without providing available funds for paying the interest, has already been carried to a point beyond which it cannot be pushed without producing serious mischief. . . . On a part of the debt already contracted for internal improvements, the interest can only be paid by new loans, unless you

resort to taxes of some kind; . . . Very few, I should hope, would advocate the reckless policy of contracting a debt, even for such an object, and constantly and rapidly accumulating it by loans to pay the interest. . . . Can we claim the continuance of public confidence on the assumption that a future generation will take better care of public credit than we are willing to do? . . . The treasury is entirely exhausted, and you are therefore required to provide for the support of these canals, and to pay the interest on the debt contracted on their account for the present year, more than one hundred thousand dollars.”²²

As early in the season of 1836 as the weather would permit, the greater part of the line from Albany to Buffalo was reexamined by the engineers. Experience during the previous decade had disclosed the places where the canal could be bettered in the plan of construction and in location, and the engineers determined to avoid some of the inconveniences to which navigation had been subjected. Especially troublesome were the short pound-reaches that were located at the nine locks above the junction of the Erie and Champlain canals, at the three locks close by and at the four locks above Cohoes falls. With the locks lengthened and the boats enlarged, the reaches would become still shorter and more troublesome. Therefore, after a very careful examination, the canal board decided in favor of an entirely new location for a distance of four and a third miles, leaving the old line about one and a half miles above West Troy and joining it again above the four locks. The estimates showed this plan to be more expensive than to enlarge the old route, but its importance and decided advantages were considered to more than counterbalance the difference in cost. The locks could be so located as to give convenient pound-reaches between them, and the lifts could be so arranged as to reduce their number from nineteen to sixteen, without making any lift more than ten feet.

The question of changing the location between Cohoes and Schenectady from the north side to the south side of the Mohawk was very important, and one that divided the members of the canal board. It will be recalled that this was one of the most difficult portions encountered in locating the original

²²*Assembly Documents*, 1836, No. 2, Governor's Annual Message, pp. 9-13.

canal, and that then the best solution was thought to be the crossing of the river twice on long aqueducts rather than the attempt to remain on the south side. At this time, however, after thorough examinations, the engineers reported the change feasible. To dispense with two aqueducts across the Mohawk was very desirable, and also the possibility of doing the work in the most favorable season of the year, and under circumstances of less embarrassment than on the old line, was an argument with weight, but the idea of abandoning about thirteen miles of existing canal, where damages to private property had been assessed and paid, and business establishments had been built up, and where the damages by reason of enlarging the canal would be very limited in comparison with those on a new route—this idea was calculated to make a strong impression against so material a change. The final decision was in favor of the old line. A rumor, which, however, cannot be substantiated from the records at hand, has gained considerable credence, to the effect that the desire to gain needed political support and to please the people of Saratoga by not removing the canal from their county played a large part in influencing the decision.

Among the other important changes may be mentioned those at Utica. Here the width was to be contracted to sixty feet through the central part of the city; this contraction was adopted to avoid extensive damages to private property, although somewhat inconvenient for navigation. The surface of the water at this place was not much above the level of the street. To raise the water three feet would require the bridges to be elevated to an inconvenient height, and would materially injure the business located near the canal. To obviate these objections, the bottom of the canal was to be lowered three feet through the city and to the end of the Frankfort level. This plan would render it necessary to construct a three-foot lift-lock near the western boundary of the city, but would retain the surface of the water in the enlarged canal at the same elevation as in the existing canal.

It was decided to change the location of the aqueduct at Sanquoit creek to a position a few rods farther down the stream; this would straighten and improve the alignment. It was also decided to change the location of the aqueduct over the Oris-

kany creek and to change the line of the canal on each side of it, carrying the canal on the north side of the Oriskany factory. This change required a new canal for about half a mile in length. These alterations not only improved the alignment of the canal but permitted the construction of the aqueducts during the season of navigation, the most favorable time for work.

The two locks at Lodi (now eastern Syracuse) were found to be in such a dilapidated condition as to require rebuilding. They were placed very close together, leaving but a short pound-reach between them. To remedy this inconvenience it was decided to change the location of the upper lock, carrying it twelve chains farther east, and there to build a set of double locks on the enlarged plan. It was also decided that the location of the lock at Syracuse should be ten chains east of the existing lock. This had a lift of only six feet, but as the Syracuse level was to be cut down two feet, the enlarged lock would have a lift of eight feet. The stone aqueduct over Onondaga creek, which partially failed in the summer of 1834, and over which navigation had been kept up by a wooden trunk of the width of a single boat, was required to be rebuilt for the enlarged canal. The enlargement through Syracuse was so intimately connected with the construction of the locks and the aqueduct, that it was determined that work for about three miles should be put under contract at once.

Beginning August 22, 1836, a number of proposals were received for constructing various sections and structures of the enlarged canal. The majority of the work for which proposals had been made was put under contract, the balance not being let because the bidders did not procure the necessary security to insure the faithful performance of their contracts. Many of the contractors began work in this year. The estimated cost of the work under contract was \$3,035,087.44. The canal commissioners stated that, had not the enlargement been authorized, \$550,000 of this amount would have been required for necessary repairs, and they further stated that according to their calculations the amount let in this year would consume the tolls applicable to enlargement for 1836-7-8-9, and, therefore, under these conditions, no more work could be let until 1839. Moreover, they deemed it their duty to state that there were several

places on the canal where its immediate enlargement would be advantageous to navigation. So important did they consider this subject that they reiterated the statement in their annual report for the following year (1837), and they added that they believed that public interests would be essentially promoted by as speedy a completion of the whole canal as "the facilities for obtaining means and proper economy in reference to the expenditure" would justify.

By the first of July, 1836, the surplus revenue derived from the Erie and Champlain canal fund had amounted to a sum amply sufficient to pay off the remainder of the debt (\$3,582,502.73) contracted for the construction of these two canals. By this event the auction and salt duties were discharged from the constitutional pledge securing them to that fund and were restored to the treasury for general purposes. But there was yet a further canal debt of over three million dollars, contracted on account of the Oswego and lateral canals, on which, as payment from their several revenues was the sole source of funds for extinguishment, the prospect of discharging the debt was considered very faint and distant. The total tolls for the year ending September 30, 1836, on the Erie and Champlain canals, was \$1,548,536.18 and the whole income of the fund belonging to these canals from all sources was \$1,947,483.61; and after deducting all expenses, the net revenue was \$1,341,934.36.²⁴

During the legislative session of 1837, there appeared the first intimation that the enlargement would cost more than the amount reported a year before. In reply to a Senate resolution of February 21, "whether from the surveys, examinations and estimates [then] possessed, they [believed] said enlargement [could] be completed at the cost heretofore estimated, and if not, at what additional cost, including damages to individuals,"²⁵ the canal board said that they did not believe that the work could be completed for the sum previously estimated, because plans for some of the structures had been changed, parts of the alignment had been altered and probably other deviations would be made, and the cost of construction was greater than when the estimates

²⁴*Governor's Annual Message*, 1837.

²⁵*Senate Journal*, 1837, p. 128.

were made. They had no further surveys on which to base their opinion, but they did not believe the additional cost would be large, exclusive of damages, the amount depending upon the prices of labor and materials. No estimates of damages had been made, as the statute provided that these should be adjusted by three appraisers appointed by the Governor and the Senate.²⁶

During 1837 several important changes were decided on by the canal board. A new location at Rome had been authorized by a special act²⁷ of the Legislature. It will be recalled that the original Erie canal had been built about half a mile south of the Western Inland Lock Navigation Company's works, which had extended through the southern part of this village, and that, at the time of the celebration attending the opening of the canal in 1825, the villagers had shown their disapproval of the change by marching through the streets to the solemn beat of muffled drums. The surveys of routes by the old canal and by a new line were reported to the commissioners on May 25, 1837. The estimates showed a difference of \$22,590.85 in favor of the existing location, but by the adoption of the new line the construction of a section of the Black River canal would be obviated, which was estimated to lessen this amount by \$9,000. The saving of about half a mile of distance on the Black River canal and of eleven hundred feet on the Erie, and the advantages of better accommodations for the citizens of Rome were counted as benefits to outweigh the additional cost. Therefore, it was determined to construct an independent canal, which brought the course back to near the location of the old Navigation Company's channel.

Another important deviation was at the Jordan level. What was known as the Jordan level of the old canal was a summit level, twelve miles long, having a lock of eleven feet lift at each end. It was decided to cut this level down, thus dispensing with the locks. Two lines were surveyed for an independent canal—one to the north and one to the south of Lamberton's hill. The line to the south was decided by the canal board to be the more advantageous, commencing a short distance east of the lock at Nine Mile creek, which was taken in as a feeder, and running

²⁶*Senate Documents*, 1837, No. 53.

²⁷*Laws of 1836*, chapter 210.

south of the old canal about two miles, where it crossed the old channel, and then continuing on the north side to the village of Jordan. This change would save one mile in distance and \$18,323.72 in cost, besides the annual expense of repairs and attendance of a set of double locks at each end of the level. *

The commissioners reported that a large amount of work had been done on the locks during 1837, but not as much as had been desired, and that the contracts for other structures and for canal sections had progressed satisfactorily. In closing their report they made a strong appeal to the Legislature of 1838 for a more liberal supply of funds, in order that the undertaking might be pushed with vigor, calling attention to the reduced freight rates and the increased tolls that would follow its completion.

Reviewing the situation of 1837, Governor Marcy, in his message, admitted a falling off of \$275,000 in tolls from those of the previous year, the gross amount being but \$1,326,781 for the fiscal year. Used as channels of trade, the canals necessarily participated in its fluctuations. In consequence of the scanty crops of 1836, the eastward tonnage was diminished, as was also the amount of merchandise sent westward. The income of the Erie and Champlain canal fund, from all sources, was \$1,426,071.78. Of this amount \$632,881.20 was expended on the enlargement of the Erie. The estimates for unfinished works of internal improvement, including enlargement of the Erie canal, were \$15,000,000. The completion of the aqueduct at Rochester was urged as a necessary measure to keep up the business of the canal in case of the failure of the old aqueduct. In the Governor's opinion a still larger appropriation might be advantageously used for improvements. The channel of the Erie canal, he said, was at least as eligible for western trade as any that could be opened and both duty and interest required that it should be made adequate to the public wants without delay. The Governor recalled his previously unheeded messages as to the necessity of a financial system to meet the interest charges and ultimately to extinguish the principal of the public debt.²⁸

The appeal of the commissioners for funds brought a response in the form of a law, directing a loan of four million dollars, but before its enactment the Assembly adopted a resolution

²⁸*Governor's Annual Message, 1838.*

which reflected the growing sentiment that the State had undertaken too large an enterprise. The effect of the financial panic of 1837, with its suspension of specie payments, was becoming evident. This resolution called for an opinion from the canal commissioners as to the most practical plan for completing the work of doubling locks, without the immediate enlargement of the prism. In reply the commissioners said, that, after the act of 1835 had directed the enlargement of the Erie canal, they had regarded the policy of the State on that subject as settled, and had made all plans and arrangements on that supposition, but they added that no work had been placed under contract that was not necessarily connected with the use of the new locks, except short sections at Albany, Utica and Syracuse. However, if the whole project could not be completed, they recommended that certain necessary portions be undertaken, saying:

“The work for the enlargement of the canal not under contract, that in the opinion of the Commissioners ought to be immediately commenced is: the doubling of the locks from Albany to Syracuse; taking in additional feeders and enlarging the canal near the locks; rebuilding the lower aqueduct across the Mohawk river; building aqueducts over the Schoharie and several other creeks between Schenectady and the Little-Falls; enlarging the canal through the east part of the city of Utica and building an enlarged weigh-lock at that place; re-building the aqueduct over the Oneida creek and enlarging the canal at the ends of it; cutting down the Jordan level and taking in a feeder from the Nine-mile creek; building an enlarged weigh-lock at Rochester; and enlarging the canal through the mountain ridge, re-building the locks at Lockport, and the guard-lock at Pendleton.”²⁰

To carry out this recommendation the Legislature enacted a law²⁰ authorizing the commissioners of the canal fund to borrow four million dollars on the credit of the State, and directing the canal commissioners to put under contract, with as little delay as possible, such portions of the work as their report had described in the paragraph just quoted, and also “such other portions as in the opinion of the canal board [would]

²⁰*Assembly Documents*, 1838, No. 251, p. 8.

²⁰*Laws of 1838*, chapter 269.

best secure the completion of the entire enlargement, with double locks on the whole line." The canal board decided that the additional parts should be the Irondequoit embankment and the heavy embankments in the Mohawk valley. During 1838, the work authorized by the law was put under contract, except at the Irondequoit embankment, which was delayed to make surveys for a new route. It was alleged by certain petitioners of Monroe county that a saving of several miles could be made. Although the survey verified this statement, it showed the cost by the new line to be more than twice that by the old, thus causing the canal board to decide on the enlargement of the existing canal.

At several places in the valley of the Mohawk river navigation was often interrupted by the streams that crossed the line of the canal. In planning the enlargement in this valley, one great object was to cross on aqueducts all the large streams, which were then taken into the canal. This was considered indispensable. Perhaps the most troublesome of these had been the Schoharie creek. On the west bank of this creek the canal was locked into the stream, which it crossed in a pool formed by a dam across the creek. At a point four miles above there was another lock, and about midway on this section the canal crossed another large creek in the same manner. These were turbulent streams and occasioned much trouble to navigation. Accordingly, it was determined to raise the level of the canal sufficiently to cross both streams on aqueducts. It was also decided to cross Indian Castle creek and the streams at Fort Plain, Canajoharie and Sprakers by aqueducts.

The engineers estimated that the cost of the work then in progress (1838), at contract prices, would amount to \$10,405,913.38, exclusive of engineering, superintendence and contingencies. This estimate clearly indicated that the total expense of enlarging the canal would greatly exceed the amount reported in 1836. In explaining this difference, the canal commissioners stated that the estimate given in 1836 was made in 1835, while the question of dimensions was still pending, and that it was made chiefly for the purpose of showing the comparative costs of the two proposed sizes. They declared that the surveys and estimates were made in too short a time—three

months—to allow the making of well-developed plans or a proper study of conditions. Many necessary changes and improvements had greatly increased the cost. They called attention to the fact that the law authorizing the work of enlargement was passed in 1835, before the estimates had been made, and accordingly the amount reported in 1836 should not be taken as the basis for legislative action; also that the canal board, in submitting the estimates to the Legislature in 1836, was careful to state that, although they were made with all practicable care and correctness, they could not be considered with much certainty, and great allowance should be made for the short time and the difficulty of estimating under existing circumstances.

The aggregate canal tolls and water rents for the fiscal year, 1838, were stated in Governor William H. Seward's ensuing annual message to be \$1,481,602.41. Repairs and collections, now termed maintenance, were \$639,714.32, leaving net proceeds of \$841,888.09. The gross income of the Erie and Champlain canal fund was \$1,553,136.84. Of this \$449,058.64 had been expended for repairs, \$129,374.05 for interest and \$26,892.65 for sundry payments, leaving a balance of \$947,811.50 in the fund. During the same period the commissioners expended \$1,161,001.80 on the Erie enlargement. Under the act of April 18, 1838, they borrowed, including premiums, \$1,005,050, leaving a deficiency of \$155,951.80, which was also paid from the above surplus, reducing the fund to \$791,859.70. Moreover, the tolls of the laterals were but \$58,264.76, while their expenses, including interest on construction funds, were \$229,160.59, and this deficiency was, as usual, loaded upon the fund, still further reducing it to \$562,699.11.

The Governor advocated limiting the term of office of the canal commissioners to bring them within closer reach of the appointing power, in the interests of economy. One-fourteenth of the sum received for tolls was expended in salaries and, including repairs, almost one-half of the entire tolls was absorbed. Such a system, he thought, was without doubt capable of advantageous revision. With extended improvements the official power and patronage of the commissioners and the canal board had been enlarged to an immense and unlooked-for extent; but little publicity or accountability was required; a great, mysterious and

undefined power had thus grown up unobserved, while the public had been narrowly watching less important functionaries. It was suggested that a board of internal improvements, composed of a number from each senatorial district, would be more economical and efficient. "It is the worst economy," said the Governor, "to devolve upon officers constituted for one department, duties appurtenant to others. Its universal results are diminished responsibility and diminished efficiency in both the principal and incidental departments."³¹ This was in the line with Governor De Witt Clinton's suggestion of a "board of public improvements," made in 1822 and renewed in 1825.

Governor Seward took a much more hopeful view of the financial situation than had his predecessor, seeming to reflect the popular sentiment that the canals were fully able to pay the cost of enlargement. He said: "Taxation for purposes of internal improvement is happily unnecessary as it would be unequal and oppressive . . . The present resources and credit of the State shew that the most ardent advocates of the [canal] system failed altogether to conceive the vast tribute which it has caused already to flow into the treasury.

" . . . their productiveness would warrant the State in expending in internal improvements \$4,000,000 annually during a period of ten years; . . . the revenues of the canals alone would reimburse this expenditure previous to the year 1865 . . . It [the State] has increased four-fold the wealth of its citizens, and relieved them from direct taxation; and in addition to all this has carried forward a stupendous enterprise of improvement, all the while diminishing its debt, magnifying its credit, and augmenting its resources."³²

However, the Governor saw the danger that might ensue. Continuing, he said: "This cheering view of our condition ought to encourage neither prodigality of expenditure nor legislation of doubtful expediency. . . . Rigid economy ought to be enforced, and perfect accountability exacted."³³

In answer to an Assembly resolution of February 20, 1839, the engineers submitted to the commissioners a report³⁴ of the

³¹*Assembly Documents*, 1839, No. 2, Governor's Annual Message, p. 6.

³²*Id.* pp. 20-23.

³³*Id.* p. 23.

³⁴*Assembly Documents*, 1839, No. 339.

cost of work completed, of that under contract and also of that yet to be put under contract, including amounts for engineering, superintendence and contingencies. This estimate amounted to \$23,402,863.02. The following statement of the main items that were omitted in the estimate of 1835 shows to some extent in what the difference between the two estimates consisted:—damages, about seven per cent; enlarging the West Troy side-cut and doubling its locks; five additional aqueducts in the Mohawk valley, including necessary changes of the canal at those places; additional width of excavation through the mountain ridge at Lockport and at various points on the line; additional width to the berme and towing-path embankments; two weigh-locks; five weigh-lock houses and scales; increased dimensions, and improved quality of masonry in locks, aqueducts, culverts and bridges, increased amount of slope wall—the estimated cost of these items was \$6,143,969. This amount together with \$12,416,150—the estimate of 1835,—increased by thirty-three per cent, or \$4,097,329.50, for the rise in the cost of labor, provisions, team work, etc., makes a sum total nearly equal to the estimate just stated.

The only act, passed at the session of 1839, which appropriated money for purposes of internal improvement, was one directing that \$75,000 be used for improving the navigation of the Oneida river.

The gross receipts of the canals for 1839 (fiscal year), including water rents and land sales, were \$1,656,902.11. The ordinary charges were \$459,987.59, to which was added \$139,111.78 for the Glens Falls feeder, the Black River canal and feeder and the Tonawanda and Ellicott creek improvements and payment of previous liabilities under special acts, leaving the net tolls \$1,057,802.74.³⁵

The canal commissioners reported that a large amount of work had been done on the enlargement during 1839, but not so much as was contemplated, because, on account of the anticipated difficulty in obtaining the balance of the loan authorized in 1838, the contractors had not been pressed to a vigorous prosecution of their work. With the uncertainty of being promptly paid for their labors, the contractors had preferred to proceed with cau-

³⁵*Assembly Documents*, 1840, No. 2, Governor's Annual Message, p. 2.

tion. This uncertainty was due to the deplorable condition of the State's finances. The sudden and calamitous revulsion in the business prosperity of the entire nation, which had culminated in the panic of 1837, the cessation of specie payments by the banks, the fear that the worst was yet to come, and above all, the persistent draining of the treasury for expenses of government and works of improvement, through the failures of the various Legislatures to provide an adequate system of finance—such conditions tended to cast an all-pervading gloom over the people and to cause them to lose confidence in the solvency of the State. The result of this state of affairs was of course felt by the canal authorities. Money could not be readily borrowed and the stock brought very small premiums; in fact the credit of the State was in jeopardy and, although the enlargement was looked upon as a necessity and much had been done already, it became necessary to curtail expenditures in order to protect and rehabilitate the credit of the State.

Governor Seward, in his message to the Legislature of 1840, indorsed this idea of retrenchment, but favored the plan of proceeding with as much energy as the circumstances would allow, saying:

“During the severe [financial] pressure we have experienced, the industry of the citizen has been stimulated, and the wages of labor, the prices of the products of the earth, and the value of property have been sustained by expenditures in the prosecution of this [canal] system. The sudden arrest of such expenditures, and the discharge of probably ten thousand laborers, now employed upon the public works, at a time when the circulation of money in other departments of business is so embarrassed as almost to have ceased, would extend throughout the whole community, and with fearful aggravation, the losses and sufferings that as yet have been in a great measure confined to the mercantile class.”

Referring to the project of enlarging the canal, he said: “The act of 1835 directed the enlargement to be undertaken when the canal board should be of opinion that public interest required the improvement, and its extent was submitted to their discretion. It will not, I hope, be deemed disrespectful to remark, that the first step in this great undertaking, the delegation of the

legislative power to a board not directly responsible to the people, was a departure from the spirit of the constitution, so unfortunate in its consequences, that it should remain a warning to all future legislatures. The expense of the enlargement is now estimated at \$23,402,863; yet the law by which it was authorized passed without any estimate having been submitted to the Legislature, and with scarcely any discussion. If completed on the present scale, the canal will surpass in magnitude every other national work of internal improvement; yet all the responsibilities in reference to the dimensions and cost of the enlargement seem to have been cast off as unworthy the consideration of the Legislature." In reference to the revised estimate for the completion of the Erie enlargement and the Black River and Genesee Valley canals, he continued: "The confidence of the people in the policy of internal improvement, has sustained a severe shock from the discovery that the state was committed by the Legislature to an expenditure of thirty millions of dollars, for the completion of three works alone, upon estimates of the same works rising only to about fifteen millions."²⁶

The Governor devoted the greater part of his message to an advocacy of the canals, but admitted that "apprehensions prevail that the public credit may become too deeply involved in the prosecution of works of internal improvement." "The policy indicated by public sentiment," he said, "and demanded by the circumstances of the times and the condition of the state, is to retrench the expenditures upon our works of internal improvement and prosecute the system with moderation and economy." In regard to securing funds for public works, he said: "The existing and anticipated revenues of the canals must be, as heretofore, the basis of any new loans which the Legislature shall see fit to authorize, since taxation for purposes of internal improvement deservedly finds no advocate among the people." And he added,—in a vein which showed with what confidence the canals were looked to for supplying funds: "Unlike other communities, this state borrows no money for purposes of war or defence, to pay salaries or pensions or the interest or principal of former loans, or even to endow institutions of learning, be-

²⁶*Assembly Documents*, 1840, No. 2, pp. 18, 19, 21 and 24.

nevolence or religion. Her income is sufficient for her wants, without taxation; the value of her productive property is double the debt she owes; her surplus income is double the interest she is required to pay; and the revenues derived from her canals, if judiciously managed, will be adequate to every enterprise which the interests of the people shall demand."²⁷

Mr. George W. Lay, member from Genesee county, of the committee on canals and internal improvements, to which was referred so much of the message as related to canals and internal improvements, agreeing with the Governor, thus reported: "The present condition of the finances of the country, and the general embarrassment pervading every portion of the United States, in consequence of the deranged and unsettled state of the monetary affairs, has had a tendency alike to alarm the timid, and shake the confidence of the more cautious, in regard to the policy to be pursued in future, as to our system of internal improvements."²⁸

Continuing, the report says: "The enlargement of the Erie canal to the dimensions fixed and established by the Canal Board has been for the last three years considered as a question definitely settled. It was a subject *deliberately examined, thoroughly investigated and discussed*, and as *solemnly adopted*. No trivial, transient, temporary cause now existing, ought, for one moment, to disturb or unsettle a decision so important to the interest of the people, and the prosperity and credit of our State. It is not now to be decided whether the people would have consented to adopt the several projects which have involved the State in the expenditure of the large sums of money which will be required for their completion. Had they foreseen that the estimates upon which these works were based would prove so entirely inadequate; or could they have anticipated so sudden and unexpected a revulsion in everything connected with the business and prosperity of our country, your committee are satisfied that more cautious counsels would have prevailed, and we should not now be called upon to deliberate and decide what measures should be adopted to guard the honor and credit of our State, and protect the right and property of our citizens. . . . The representa-

²⁷*Assembly Documents*, 1840, No. 2, pp. 18, 24 and 39.

²⁸*Assembly Documents*, 1840, No. 277, p. 1.

tives of the people approved of the undertaking, and year after year they have given the most unequivocal demonstrations that their confidence in the utility and value of public improvements, judiciously made and carried on, remains unshaken."³⁹

In spite of repeated assertions from canal officials that nothing short of an enlargement of the whole canal would afford more than temporary relief, the Assembly again raised the question of abridging the enterprise. In reply to a resolution of March 2, 1840, asking the canal board "whether, in their opinion, any change [could] now be made advantageously to the public interests in the plan, dimensions or manner of execution of the work adopted for the enlargement of the Erie Canal, so as to lessen the expense of that work; and also, how long a period of time [would] be required to complete most advantageously to the public interests, the enlargement of said canal;"⁴⁰ the officials answered⁴¹ that, in their opinion, no changes ought to be made in the plan, dimensions and manner of executing the work. The object of the enlargement was to remedy those defects which had been so frequently explained. To change the plan and dimensions, they argued, would be to defeat the very object of the enterprise, namely, to cheapen transportation and to accommodate the increasing traffic. Moreover, to vary the details of existing contracts, especially after much progress had been made in their performance, would be vexatious, embarrassing and difficult. With regard to the structures thereafter to be put under contract, the board was of the opinion that a cheaper style of masonry could be adopted for bridges, culverts and aqueducts, but such a change would impair their strength and durability. As to the time required to finish the enlargement of the canal, that would depend upon the resources of the State, and the Legislature would be able to determine in each year the amount of work that could be judiciously undertaken.

The Legislatures of 1840 and 1841 were constrained to adopt a policy of retrenchment. However, they persevered in the construction of public works, but with moderation and economy, trying to guard against a dangerous increase of debt and the

³⁹*Assembly Documents*, 1840, No. 277, pp. 3-4.

⁴⁰*Assembly Documents*, 1840, No. 204.

⁴¹*Assembly Documents*, 1840, No. 306.

possibility of taxation, in order that the whole debt of the State might be kept within such bounds that the interest should not exceed the net revenue from canal tolls, and that any increase in the revenue might be applied to the payment of the debt.

During 1840 a loan of \$2,000,000 for the Erie, \$500,000 for the Genesee Valley and \$250,000 for the Black River canal was authorized,⁴² and in 1841 another⁴³ of \$2,150,000 for the Erie, \$550,000 for the Genesee Valley and \$300,000 for the Black River. As indicating the anticipated stoppage of all work in the near future, it is significant to notice that, with the exception of a lock at Black Rock dam and some work at Rochester, these acts restricted all operations to such as were necessary to render available the work then in progress and to prevent the interruption of navigation. During 1840 very satisfactory advancement was made, the season being unusually favorable, and the effect of the suspension of public works in neighboring states becoming manifest in the reduced price of almost every kind of labor and material. In 1841, however, the need of funds was more severely felt, not enough being available to complete the work within the time specified in the contracts.

To digress a moment, we observe that during the legislative session of 1840, a concurrent resolution was passed, giving consent to the construction by the Government of the United States of a ship canal around the falls of Niagara, and requesting the Senators and Representatives of the State in the Congress of the United States to use their best efforts to secure the passage of a bill for this purpose.

Still digressing, we notice another interesting fact. "The first bridge in America consisting of iron throughout," said one recently, "was built in 1840 by Earl Trumbull over the Erie Canal, in the Village of Frankfort, N. Y. In the same year Squire Whipple, Hon. M. Am. Soc. C. E., also built his first iron truss bridge."⁴⁴

The gross receipts of the canals for tolls and rents for the fiscal year 1840 were \$1,606,827.45 and the gross charges, exclusive of

⁴²*Laws of 1840*, chapter 161.

⁴³*Laws of 1841*, chapter 194.

⁴⁴Charles C. Schneider, in President's address, *Transactions of the American Society of Civil Engineers*, Vol. LIV., p. 216. Address entitled "The Evolution of the Practice of American Bridge Building"; delivered June 20, 1906.

interest on loans, \$586,011.87, leaving a net revenue of \$1,020,815.58, a slight falling off from the previous year. But the tolls and rents received during the entire season of navigation were \$1,775,747.57, showing a gratifying increase of \$159,365.55. The canals were navigable from the twentieth of April to the fourth of December. The depth of water and consequently the tonnage of boats was increased, thus reducing expense of transportation. The Erie enlargements were prosecuted with vigor so far as permitted by appropriations. The amount expended for this enlargement prior to January 1, 1840, was \$4,669,661. The appropriations and canal revenues of that year were \$2,869,171, making an aggregate for this work of \$7,538,832. In reviewing the year's work, the Governor said that the experience of the present commissioners justified the belief that the cost of the enlargement would not exceed the corrected estimates of 1839, or \$23,112,766. There would, therefore, be required to finish the enlargement, \$15,573,934. That portion lying between Albany and Rome, said the Governor, might be completed in the spring of 1843; the part extending from Rome to Rochester by the spring of 1845; and the residue, from Rochester to Buffalo, by the spring of 1847.⁴⁵

Again in 1841, Governor Seward advocated the policy of retrenched expenditures and perseverance in the construction of public works, with moderation and economy; also the referring of all unfinished works to competent engineers to determine what portion could be safely delayed; the establishment of what he termed a canal board to prevent erroneous estimates and inconsiderate legislation; and the limiting of all issues of stock so that the interest charges should not exceed the net canal revenues. This policy was not, the Governor said, to be regarded as one of abandonment but of retardation for the sake of economy.⁴⁶ The Governor had made these same recommendations in his message of a year earlier.

In 1841 there was introduced in the Assembly a measure which was destined to play a large part in the future financing of the canals. Says a recent writer, in speaking of this proposition: "The theory that all legislative power is vested in the legislature

⁴⁵*Governor's Annual Message*, 1841.

⁴⁶*Id.* p. 29.

had for many years been applied in actual legislative practice in a manner not always conducive to public interest, and which did not exhibit a clear appreciation of legislative responsibility. Some persons began to think that the legislature had too much authority, and that it should not have unlimited power to create debts, appropriate money, and impose taxes. This opinion was expressed in concrete form by a proposed constitutional amendment offered in 1841 by Arphaxed Loomis, a member of assembly from Herkimer county, and who was afterward an influential member of the Convention of 1846, which provided that every law creating a debt against the state must specify the object of the indebtedness, must be limited to one object only, which must be specifically stated, and could not take effect until approved by the people at the next general election. The prohibition did not apply to debts created for the purpose of repelling invasion, suppressing insurrection, or defending the state in war. It will be observed that the proposition did not permit the legislature to create indebtedness within the moderate fixed limit to meet emergencies, as provided by the section adopted in 1846, and which has since continued in force. The proposition is significant as an attempt to vest in the people control over all legislation creating state debts. It is known in history as 'the people's resolution.' It is evident that public opinion was not yet ready for such a radical change of policy, for the proposition failed in the assembly by a tie vote of 53 to 53. In 1842 many citizens petitioned the legislature to incorporate the principles of this resolution in appropriate amendments to the Constitution. The resolution was again introduced, but was not passed, and not till 1844 did the legislature go so far as to propose amendments embracing these restrictions on legislative power."⁴⁷

In view of the cessation of canal improvements in 1842, it is interesting to note a statement of the commissioners in regard to the business transacted in 1841. The gross amount of tolls, they say, was \$2,034,882, an increase of \$259,135 over those of 1840, or about fourteen per cent. At one of the locks there were 30,320 lockages (an average of one every ten and a half minutes), or more than twelve per cent over the preceding year. They

⁴⁷Lincoln's *Constitutional History of New York*, Vol. II., pp. 82-83. (Rochester, 1906.)

stated that "the lockages required to pass the boats, had become so numerous and frequent, that the channel of the canal had not sufficient capacity to pass the necessary amount of water without great delay and embarrassment; that the difficulty did not consist (as had been generally supposed), in any want of capacity in the locks to pass the boats, if sufficient water could be passed through the channel, but in the want of capacity of the channel itself."⁴⁸

When the Legislature of 1842 convened, the financial affairs of the State were at a crisis. Governor Seward seems to have considered the situation less serious than it really was. Probably Governor Bouck, after a lapse of a year, was in a position to view the conditions more clearly, as we shall see presently. Doubtless Governor Seward's zeal for the welfare of the canal and his faith in its self-sustaining ability overshadowed his perception of the difficulties that threatened a continuation of work under existing conditions. In his annual message, he said, in substance: If we would preserve the inestimable benefits of inland navigation, save the treasury from embarrassment, maintain the public faith, prevent general distress, retain our commercial precedence and political influence, and guard against the dismemberment of our territory, it is necessary to complete the enlargement of the Erie canal throughout, and with all convenient diligence. Speaking of the canal debt, he said: "Large as this sum is, there is no reason to suppose that it passes our fiscal ability. . . . The debt is large because the enterprise is great. It remains for you to decide whether the indebtedness shall be made larger, or whether you will devise a different system of finance; but if the present system and progress are continued, the entire enterprise will be accomplished in 1846. . . . The canal revenues [may] . . . extinguish the debt incurred in their construction within fifteen years thereafter; after which these great public works will continue to pour into the treasury a river of tribute." In conclusion, he said: "I recommend that all the future revenues from the National Domain shall be pledged as a sinking fund to the extinguishment of the principal of the public debts, . . . If seventeen millions of dollars are yet required to complete our public works,

⁴⁸*Assembly Documents*, 1842, No. 24, p. 6.

the system I have suggested would in 1855 discharge the whole of our present and future indebtedness."⁴⁰

Viewed in the light of subsequent history, perhaps Governor Seward's faith was justified and it may be that the better way would have been to have pushed the work to completion, at the expense of increasing the debt, but the State's best financiers of the time could see no way out of the difficulty but to precipitately suspend operations and order a tax to satisfy the creditors of the State.

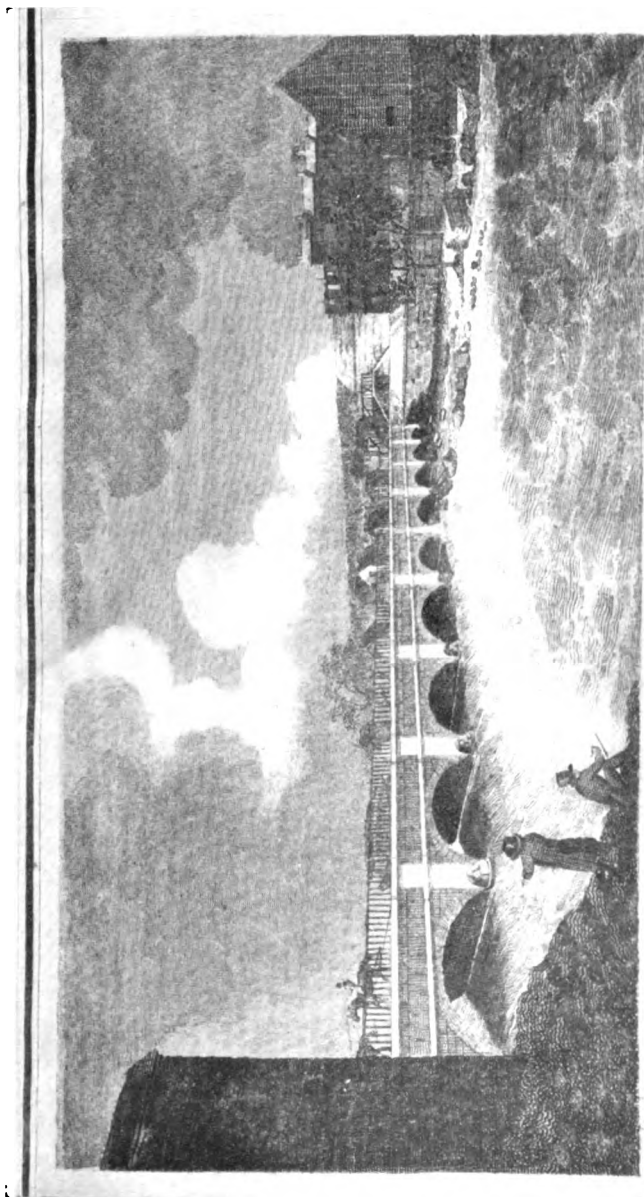
In describing this period Governor Bouck said: "The Legislature of 1842 convened at a period of great embarrassment in the financial affairs of the State. The treasury was empty; our credit seriously impaired; the State stocks were selling at ruinous sacrifices; temporary loans were nearly at maturity; the time for the quarterly payments of interest on the public debt, amounting to more than \$20,000,000, was fast approaching; contractors were pressing for payment, and the progress of the public work virtually suspended. Under such circumstances to have continued large expenditures, or indeed any not demanded by imperious necessity, or good economy in reference to the condition of the public works, and that good faith due to our citizens with whom the State had existing engagements, would in my opinion have been a wanton disregard of public duty."⁴¹

On March 7, 1842, Mr. Michael Hoffman, of Herkimer, from the committee of ways and means, to which was referred so much of Governor Seward's message as related to State finances, reported⁴² to the Assembly. After carefully considering the whole financial situation, the State debt—given by the report as \$26,226,092.80, of which the canal debt was \$19,056,466.22—the demands upon the State for the next four years and the means or lack of means for meeting those demands, the committee presented its opinion of "the necessary course and safe policy of the State," recommending that expenditures should cease, that a tax of one mill on the dollar should be levied,

⁴⁰*Assembly Documents*, 1842, No. 1, Governor's Annual Message, pp. 19, 23, 24 and 28.

⁴¹*Governor's Annual Message*, 1843, p. 12.

⁴²*Assembly Documents*, 1842, No. 88.



Reproduction of an old print, published during the construction of the original Erie canal; design was used also for decorating china.

that the funds subject to State control should be invested in loans to meet the pressing demands of the canals and that a sinking fund should be established. In speaking of the canals, the report said that public works were already suspended; that their progress was no longer in doubt, for time, circumstances and the reckless course of the past had decided it, and had arrested that progress; that the question then was, whether by a desperate and impracticable effort to revive that progress, the credit of the State should be destroyed utterly; and that new loans for further expenditures could not be made "except on terms at once disgraceful and ruinous to the credit of the State." In its conclusions the committee was supported by the clear and frank opinions of some of the ablest financiers in the state,—such men as Albert Gallatin, George Newbold, John G. Palmer and C. W. Lawrence, who had given their opinions at the request of the committee.

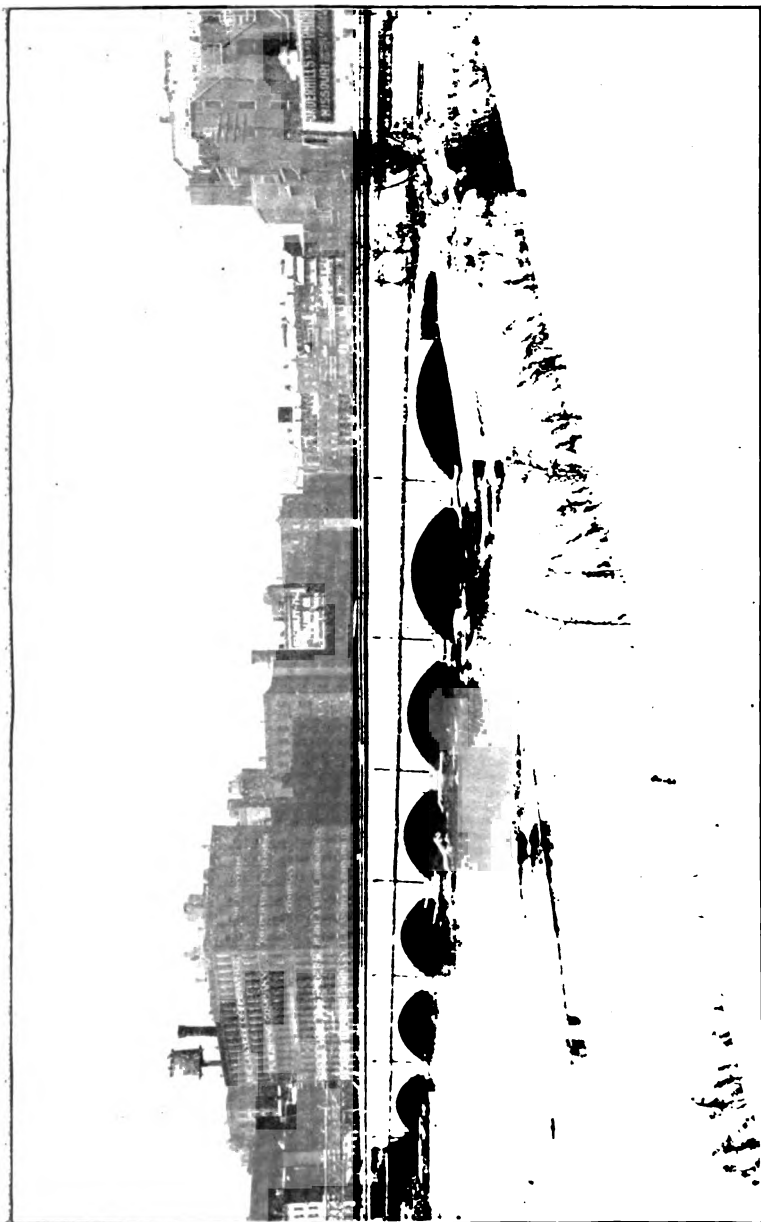
The Legislature adopted substantially the recommendations of the committee, passing an act (chapter 114), which provided for raising a tax of one mill on each dollar of real and personal estate, thus changing a policy which had been in force since 1827. The law further enacted that the whole of the proceeds of this tax in 1842 and one-half of the proceeds in the ensuing years should go to the general fund, the other half being paid to the canal fund, and that the commissioners of the canal fund might borrow certain sums to meet the immediate demands on that fund. That part of the act which dealt the most severe blow to the canals was a clause directing that all further expenditure on the public works then in process of construction should be suspended until the further order of the Legislature, except such work as was necessary to secure navigation or to preserve the parts already done. This law was described in the Convention of 1846 and became known later in executive messages as "the policy of 1842," but among the people at large and in canal and department circles it has been commonly referred to as "the stop law of 1842." In what condition it left the project of enlarging the Erie will be seen by the subsequent reports of canal officials; how it affected the various lateral canals may be learned by a perusal of the chapters dealing with those branches of the system.

In view of this action by the Legislature, it is of interest to observe a memorial⁵² that was presented to the Assembly on March 26, 1842, by several citizens of Niagara county, praying for the incorporation of a company which should be authorized to complete the Erie canal enlargement and the Genesee Valley and Black River canals, on certain conditions. Declaring their reason to be a desire to finish so important a work without interruption, to avert a tax and to place the credit of the State upon a firm foundation, they asked the privilege of forming a company, with a capital of \$25,000,000, for the purpose of completing these canals by January 1, 1845, seeking in return a portion of the tolls for a limited term of years.

Reviewing the events of the year, Governor William C. Bouck said, in reference to the act of 1842, that the praiseworthy and patriotic exertions of the last Legislature to relieve the State in the crisis of our pecuniary affairs was worthy of all commendation; and if the policy then adopted had resulted in some injury to individuals, it should be ascribed to the necessity of the case, rather than a willingness that any portion of our citizens should suffer detriment. The policy of arresting large expenditures and providing for the prompt payment of the interest and a gradual diminution of the State debt, had exerted a salutary influence in reviving our credit. The question of a direct tax, rendered necessary by the exigency of our affairs, had been clearly approved by the people, but direct taxation, said the Governor, should not be regarded as a permanent measure of finance for the purpose of constructing public works, but as one of a temporary nature, called for by an existing emergency. All future appropriations should be made with reference to as speedy a relinquishment of the tax as public credit and the general welfare of the State would permit.

He also observed that very little if any of the work had been undertaken for the enlargement of the Erie canal during 1842 that was not rendered necessary by the worn and decayed condition of the mechanical structures. As to the benefits of the improvement, he said: "Already has the transportation on the canal been much benefited by the use of the new work between Albany and Schenectady, at Phillip's locks, and at the Little

⁵²*Assembly Documents*, 1842, No. 160.



AQUEDUCT OVER THE GENESSEE RIVER AT ROCHESTER.

The present aqueduct, replacing the original smaller structure, was completed in 1842. A recent photograph.

falls. At these points the navigation has been entirely relieved from the detention and delay which had been sensibly felt for several years."⁶³

The low prices of labor and provisions at the time were considered by the Governor as highly favorable to a successful prosecution of the work, with due regard to the public welfare and great caution as to increasing the public debt, already too large. That the State had the ability eventually to complete all her works, which had been commenced, could not, in his opinion, be questioned.

From the report of the canal commissioners for the same year (1842), it may be noted that numerous structures, requiring but little to complete them, were so completed and put in operation during the year. These included several important aqueducts and among them the new stone aqueduct over the Genesee river at Rochester, which was brought into use in April. The bed of the river underneath was lowered to give better passage to the water, by the excavation of 39,000 cubic yards of limestone. The aqueduct crosses the river by seven arches of fifty-two feet span each, resting on six piers and two abutments, each ten feet thick. The arched portion extends 444 feet, and the whole length, including wing-walls, is 800 feet. The waterway is forty-five feet and the parapets are ten feet thick, making width of trunk, over all, sixty-five feet. The height of the aqueduct is twenty-seven feet. The structure is built chiefly of gray Onondaga limestone and contains about 17,000 cubic yards of masonry.

In the spring of 1842, the double locks Nos. 3 to 18 (since known as the "sixteens"), together with the five sections of enlarged canal upon which they were situated, were brought into use.

The report⁶⁴ of the canal commissioners for 1842 gave full and detailed account of the condition of the whole line as it was left at the cessation of active operations.

In the cities of Albany, Schenectady and Rochester there was complaint that the public had been seriously discommoded by the unfinished state of bridges on streets intersected by the canal.

⁶³*Governor's Annual Message*, 1843.

⁶⁴*Assembly Documents*, 1843, No. 25.

The large sum already expended on these structures and the small amount necessary to complete them tended to aggravate the public mind.

It will be remembered that at Rome a new location had been selected. When work was suspended in 1842, the contractor had nearly completed parts of this independent line and had commenced excavation over the whole. In the summer of 1841 the exposing of muck and decayed vegetable matter from this excavation had the effect of causing many severe and some fatal cases of fever in the village. Soon after the Legislature adjourned in 1842, the citizens of Rome called the attention of the acting canal commissioner to the fact that disease had resulted from the unfinished state of the work, alleging also that the relative positions of the village and canal and the porous soil had caused the draining of most of the wells, and strenuously urging that the channel should not be left in a condition so perilous to public health. The commissioner felt himself constrained, by the act of 1842, to forbid any further progress being made. Thereupon the citizens made arrangements which secured the prosecution of the work, completing the section as an independent line in 1843. The commissioners referred the matter to the Legislature. By concurrent resolution in March, 1844, this independent line was authorized to be brought into use by the canal commissioners, if it could be done at less cost than by the old route, the resolution, however, repudiating any liability to the State for its construction.

While the canal board, other State officials and the Legislature seem to have been in full sympathy with the policy of the Executive, there was, of course, along the line of the canal, strenuous opposition to the cessation of work. Petitions, memorials, legislative resolutions and minority reports were in evidence, urging the continuation of operations.

In his message of 1844, Governor Bouck again referred to the conditions which made the act of 1842 necessary. He summed up the situation by saying: "Our necessities required loans, and they could not be made without doing something to revive and invigorate our credit. This was effectually done, not only by arresting the progress of our public works, but by resorting to taxation, and by pledging the avails of the State tax, and the

surplus income of the canals, to the public creditors. Such were the objects of the law of 1842, and the wise policy of the measure has been vindicated by its happy results."⁵⁵

He advocated placing a constitutional limit upon the public debt in times of peace, and restricting the power of the Legislature to create a debt. This was along the line of the proposed constitutional amendment introduced by Assemblyman Loomis in 1841.

Horatio Seymour, then of the Assembly committee on canals, to which was referred so much of the Governor's message as related to that subject, presented an exhaustive report,⁵⁶ strongly condemning the policy of 1838-1842, and making the pledges and guarantees of the act of 1842 the basis of the policy recommended for the future. He showed that, if the sound financial policy that Comptroller Flagg endeavored to establish in 1836—the policy of imposing a tax to replenish the general fund, so that the revenues of the canal might be used for their improvement—had been followed, the canal debt would not have reached the enormous sum of \$23,851,575.66 at the beginning of the year 1844. Although the necessity of the enlargement had been admitted, and the propriety of imposing a tax to enable the canals to enjoy the full benefit of their surplus revenues had been urged, the creation of any debt had been decidedly opposed by the Comptroller and its evils pointed out. The policy of 1838—of borrowing large amounts—was ruinous to the State and after a period of four years had checked the progress of the enlargement. The very magnitude of the appropriations and the vast amount of work put under contract simultaneously—all contributed to increase the expense of every undertaking by the State. To show more fully the evils of this change of policy, the report considered what would have been the condition of the canals, had not this change been made. The amount of tolls for the years 1837 to and including 1843 was \$11,843,524.49; the expenses, interest on debt, etc., for the same years amounted to \$5,013,288.05; a surplus remained of \$6,830,236.44, which would have admitted an annual revenue of more than \$1,200,000, to be applied toward the enlargement of the Erie canal, a sum which

⁵⁵*Assembly Documents*, 1844, No. 2, p. 8.

⁵⁶*Assembly Documents*, 1844, No. 177.

the committee considered quite as large as could be advantageously and economically applied in any one year.

In closing, the report said: "The issue, which has been made between improvements on the one hand and finances on the other, is a false and unnatural one. . . . We may and should have in this State a liberal system of internal improvements, furnishing the elements of and predicated upon a sound financial policy."⁵⁷

Both in 1844 and in 1845, the canal commissioners replied, in answer to legislative inquiries, that, with the exception of minor improvements made under special laws for the purpose of bringing certain nearly completed sections into use, the unfinished work of the Erie enlargement remained in about the same condition as when work upon it was stopped by the law of 1842, although the loss to the State, as well as to the contractors by disintegration of the unfinished work, was considerable.

Speaking of events in 1844, Judge Lincoln says: "The legislature at this session proposed a constitutional amendment confirming the pledges and guaranties of the act 'to provide for paying the debts and preserving the credit of the state,' passed in 1842; also an amendment limiting the aggregate debts in any one year to \$1,000,000, without a vote of the people, providing for the creation of a sinking fund, and the payment of the debt and interest in eighteen years. These propositions, except the first, became a part of the Constitution, and were embodied in §§ 10 and 12 of article 7 of the Constitution of 1846."⁵⁸

The disconnected lines of railroad running parallel with the canal were already reaching out for further privileges. The argument used for their construction had been the greater rapidity offered for passenger traffic, to which the canal was not adapted and which branch of traffic, incidentally, had never been a paying factor of canal revenues. Through the Legislature they now asked for and obtained the right to carry freights during the season of the suspension of canal navigation, on payment to the State of canal tolls.⁵⁹ This drew a strong remon-

⁵⁷*Assembly Documents*, 1844, No. 177, p. 67.

⁵⁸*Lincoln's Constitutional History of New York*, Vol. II., pp. 86-87.

⁵⁹*Laws of 1844*, chapter 335.

strance from those interested in canal traffic and an effort was made in 1845 to obtain its repeal. The committee's report^{oo} is of interest as showing the cost of the canals to the people of the State and as foreshadowing the danger of allowing this entering wedge of competition to continue. The law, however, was not repealed and the fears expressed by the petitioners and the committee were soon to be realized.

As to the influences which bore upon the question of coming competition between the railroads and the canals, Judge Lincoln, adverting to the granting of the charter to the Mohawk and Hudson Railroad Company in 1826, by the same Legislature which received the felicitations of Governor Clinton on the "auspicious consummation" of the great canal enterprise, says: "The state invited into the field of transportation a rival which was destined to become its master; and then was initiated a competition to which the state was finally compelled to yield." And again he says that "during the ten years beginning with 1826 the legislature granted 106 railroad charters, besides enacting several other laws relating to railroads. It was thus evident that the new motive power had entered on a sharp competition with the state. It did not take long to convince the statesmen of that period that stringent measures would be necessary to limit the extent of the new competition, and efforts were made from time to time, by means of the taxing power, to compel the railroad companies to contribute a portion of their earnings for the purpose of reimbursing the state for losses which the canal traffic must inevitably suffer by the new method of transportation. This new movement found its first expression in the charter granted in 1833 to the Buffalo & Black Rock Railroad Company, which required the company to pay the commissioners of the canal fund the same tolls on goods carried by it, except personal baggage, as might be charged for the same goods transported by the Erie canal, and the tolls were not limited to the season of canal navigation. Two other charters granted in 1834 contained a similar provision. Two charters granted in 1836, one in 1837, one in 1838, and one in 1839, required the payment of tolls only during the season of canal navigation. In 1840 Governor Seward, in his annual message,

^{oo}*Assembly Documents*, 1845, No. 236.

questioned the wisdom of imposing these tolls on railroads, and suggested that if they were to be continued they should be collected only during the season of canal navigation."⁶¹

In 1844, as we have just noted, the charter of the Utica and Schenectady Company was amended so that they might carry goods "during the suspension of canal navigation in each year only" on payment of tolls. "Tolls were, by the same statute, required from several other railroad companies not previously subject to this tax, covering nearly the whole line from Albany to Buffalo."⁶²

Other railroad charters followed in 1845 and 1846, imposing tolls, and in 1847 the payment of tolls was required by statute from all the companies along or near the line of the Erie and Oswego canals, nearly all of which were afterwards consolidated into the New York Central Railroad Company.

The total amount of tolls paid to the State by the six railroads between Albany and Buffalo for freight transportation from November 29, 1844, to April 15, 1845, during the season of closed navigation was \$10,458.24. The commissioners remark that this was about the average of *one day's tolls* upon the Erie canal. An investigation was had to ascertain what, if any, further amount was due, but nothing seems to have resulted from it.

In 1845 Governor Silas Wright devoted a large share of his annual message to a discussion of financial conditions, the canals forming the central theme. He advocated the proposed constitutional amendments adopted by the preceding session, but the Legislature of 1845 failed to pass these propositions again, evidently preferring to leave the whole subject to a convention, for an act was passed submitting the question of a constitutional convention to the people at the November election. If approved by them, the convention was to be held in 1846.

In the opinion of the Governor, the Legislature overstepped its authority in attempting to enact a law which would provide funds for recommencing a part of the work stopped by the act of 1842. In returning the measure with his veto, the Governor explained that, although he could approve the greater part of the law, there were some provisions that, while appearing to come

⁶¹Lincoln's *Constitutional History of New York*, Vol. II., pp. 612-614.

⁶²*Id.* p. 614.

within the restrictions imposed by the act of suspension, really violated the spirit of that policy.⁶³ Thus the Governor constrained the Legislature to abide by its former pledge to protect the creditors of the State, the measure not being passed over his veto.

In 1846 Governor Wright, in speaking of the results of 1845, advocated the continuance of the financial policy with reference to the canals which had been followed since 1842. He advised the application of the canal revenues to the extinguishment of the debt, and in general expressed a hopeful view of the situation.

The canal commissioners, in response to legislative inquiry, reiterated their statement of the preceding year, that, with the exception of special work ordered by the Legislature to improve navigation, the condition of the canal improvements remained substantially the same as when work was suspended thereon in 1842, although the loss to the State by disintegration of unfinished work amounted to many thousand dollars.

The canal commissioners had asserted in their annual report for 1845 that to complete the system of double locks on the Erie canal between Albany and Syracuse, including the completion of certain other structures necessary to bring the locks into practical use, would require an estimated expenditure of about \$295,000. Twenty-nine of the forty-nine locks were entirely completed; three more were doubled, but the old locks had not been lengthened; most of the other seventeen had been started, and several were all but completed. In considering the subject of canals, the Legislature of 1846 asked for a further estimate for the remainder of the line, from Syracuse to Buffalo, and in their reply the commissioners gave the estimated cost of doubling all the locks, except the guard-locks at Pendleton, Tonawanda and Black Rock, as \$1,599,664. The gates of these guard-locks were not generally closed during the season of navigation and it was not supposed that double locks at these places were necessary to give to the canal a capacity equal to that east of Syracuse.

The most important feature of the year 1846, in relation to the canal, was the Constitutional Convention. The Legislature

⁶³*Assembly Documents*, 1845, No. 251.

having failed for several consecutive years, for reasons political or otherwise, to approve several much needed amendments, which had been urged upon their attention by the Executive, that method of relief from existing conditions had been abandoned. Public sentiment had crystallized in the form of petitions from twenty-four counties of the State to the Legislature of 1844, calling for a convention, and in 1845 the question was submitted to the people, who gave the proposition their approval at the following November election, with but little opposition. The Convention met from July to October, 1846. Their chief object was probably the reorganization of the State judiciary system, but their labors also in relation to the canals of the State, their financial policy and the harmonious blending of the numerous and conflicting interests, opinions and policies, constituted no inconsiderable feature of their work. The strong personal, commercial and political prejudices, which had been in active controversy for several years, were to be placated, if possible, upon a basis which would secure peace and the prosperity of the canals, so closely interwoven with that of the State.

Judge Lincoln's close study of the canal questions before the Convention, of the attitude of the participants therein and the final results renders his opinion of unusual and critical value. He says: "The debate [on canals] took a wide range, covering the whole field of canal history, and involving a discussion of policies, principles, political parties, and individuals."⁶⁴ A few delegates, unalterably opposed to the canals, advocated their sale, but many, who had been so opposed, changed their opinions upon proof of their great utility to the State. The friends of the uncompleted Genesee Valley and Black River canals, which had already cost the State the sums of \$3,794,000 and \$1,544,000, respectively, and which could be completed for a comparatively small amount, were able to secure their inclusion among the "constitutional" canals, which could not thereafter be alienated from the State. This was doubtless a long step toward their early completion.

The canal article is thus summed up by Judge Lincoln. He says: "The article, as a whole, preserved the credit of the state, pledged its revenues for the redemption of all state obligations,

⁶⁴*Constitutional History of New York*, Vol. II., p. 171.

provided for the enlargement of the Erie canal and the completion of the Genesee Valley and Black River canals, authorized direct taxation to meet deficiencies, and prohibited the sale or other disposition of the canals."⁶⁵ It clearly defined the limits of future expenditures and also provided for a generous allowance from the canal revenues toward the payment of the general expenses of the State government, without imposing a direct tax upon the property of the people of the State. This confirmed the policy of supporting and maintaining the State government chiefly from the tolls of the Erie canal, as had been done in previous years.⁶⁶ The system of State maintenance by indirect taxation had not then attained the prominence it now has.

The seventh article of the Constitution provided that from June 1, 1846, there should be set aside out of the revenues of the State canals, after paying the expenses of collections, superintendence and ordinary repairs, the sum of \$1,300,000, each year until 1855, and from that time on, the sum of \$1,700,000, as a sinking fund to pay the interest and redeem the principal of the canal debt; also the sum of \$350,000 for the general fund debt, until the extinguishment of the canal debt, and after that the sum of \$1,500,000, as a sinking fund for the general fund debt. After paying these amounts from the surplus revenues of the canals, \$200,000 was allotted yearly for defraying State expenses, and the remainder of the revenues might be applied to the completion of the Erie enlargement and the construction of the Genesee Valley and Black River canals. After eight years, the appropriation for the expenses of the State government might be increased, under certain conditions, to \$350,000, until the general fund debt should be paid or the work of canal enlargement or construction, just mentioned, should be accomplished; after that period, the sum might again be increased to \$672,500.

The new Constitution, which was framed by the Convention, was by the terms of the governing statute submitted to the people for ratification in November following, and was approved with little opposition. It went into effect January 1, 1847.

⁶⁵*Constitutional History of New York*, Vol. II., p. 174.

⁶⁶*Laws of 1836*, chapter 356.

Governor John Young, at the opening of the Legislature in 1847, said that the propriety of completing the enlargement of the Erie canal was a matter about which at that time there could scarcely be said to be any diversity of opinion; also that good faith forbade the abandonment of the Genesee Valley and Black River projects. "When we recur to the fact," he observed, "that the revenues of our canals, including the interest on cash revenues, amounted, for the year ending 30th September, 1846, to nearly two millions eight hundred and fifty thousand dollars, with what entire confidence may we not rely upon the income of the canals to protect us against taxation on account of the present State debt, and for its ultimate extinction?—I speak now of the revenues to be derived from the canals in their present condition, assuming that the capacity of the Erie canal will not permit of a material augmentation of its business. Secure the trade of the great opening west, by enlarging the Erie canal, and how unimportant is our present indebtedness considered in connection with the revenues that may reasonably be expected."⁸⁷ Undoubtedly the fact that the annual tolls from the canals had by this time increased to nearly three million dollars was a powerful argument to support the optimistic views of the Governor and the friends of the uncompleted Genesee Valley and Black River canals, as well as those of the Erie enlargement.

The Governor also adverted to the charges of extravagant construction and expenses of superintendence on ordinary repairs, and asked the Legislature to consider a change to a system of repairs by dividing into sections and letting the repairs by contract. Such a law, he said, passed the Assembly of 1846, but failed in the Senate. Evidently the Governor did not then realize the objections to this system of repairs by contract, which were so prominent when that system came into vogue later on in the history of the canals.

The canal commissioners were evidently preparing to resume operations upon the suspended work of the improvements, in view of the popular trend of sentiment in that direction. They presented revised estimates for the Erie enlargement,—both on the plan of one enlarged lock by the side of the old one, and for two enlarged locks,—between Albany and Syracuse; the former

⁸⁷*Governor's Annual Message*, 1847, p. 8.

to cost \$334,000 and the latter \$639,000. The completion of double enlarged locks at Lockport was to cost \$170,000; the enlargement between Syracuse and Rochester was covered by the estimates of the previous year.⁶⁸

The last half of the year 1846 was occupied by a legislative committee in investigations generally as to fraud and extravagance in connection with prior canal construction. In addition to charges of that character, relating to the Genesee Valley canal, the committee devoted much of their report to alleged unauthorized work at Black Rock harbor, and to the construction of the flight of locks at Lockport. Their report to the Legislature of 1847 is embodied in a volume of several hundred pages and was published as *Assembly Document No. 100*, of that year. This bears the distinction of being the first important legislative investigation of the canals. While the committee asserted that plentiful evidence of extravagant methods and more or less corrupt practices was discovered, they refrained, from lack of time, to pursue the subject far enough to formulate specific charges against individuals and only asked that an extra number of copies of their report be printed and circulated. The memorials to the Legislature of the officials most interested, in their own behalf, were also published and appear as *Senate Documents Nos. 93, 94 and 109*, of that year.

In 1847 work was resumed on the canals of the state, the Legislature having made provision by appropriating funds from the surplus revenues, as provided by the new Constitution. In fact, more was appropriated than was realized from the tolls, and succeeding Legislatures continued this same practice year by year, anticipating a part of the next year's revenues, till the sum amounted to several hundred thousand dollars. The Legislatures of these years seem to have been continually striving to hasten the work beyond the limitations imposed by the Constitution, until their efforts culminated in 1851 in the temporarily successful but ill-advised scheme of selling the future income as canal revenue certificates.

The Legislature of 1847 inaugurated the work with the idea of primarily completing the enlarged locks, as we notice that the first act (chapter 259), making an appropriation (\$300,000) for

⁶⁸*Annual Report of Canal Commissioners, 1846, p. 17.*

the Erie, directed that one enlarged lock should be built at each point where a lift-lock was necessary, and then, if funds were available, a double set of locks, and after that such other work as seemed best to the canal commissioners. This law, however, provided that, of the total cost of enlarging locks, only the additional amount which the larger size would cost, more than a new structure of the original size, should be chargeable to this account, the remainder being paid for as ordinary repairs. Another act of this year (chapter 445), appropriating \$559,000, provided for specified structures, for doubling locks and enlarging a portion of the channel. Other laws of the year granted funds for work on some of the lateral canals.

The canal commissioners, in their report for the year 1847, called attention to the scarcity of feed-water for the great number of lockages required by increasing traffic. For the Rome level they advised the use of Cazenovia lake as a reservoir. They reiterated the statement, which they so often made since the work of enlargement first began, that the proposed doubling of the locks would not of itself increase the capacity of the canal, unless the prism also was enlarged.

It is of interest to note the attitude of the half dozen railroads competing with the canals at this early period in their history. Originally franchised for passenger traffic, they were later permitted to carry freight during the winter only, and that only upon the payment of canal tolls to the State. Already they were in every possible way attempting to evade and withhold the payment of such tolls. We have previously noticed the legislative investigation in regard to this subject. In 1847 it became necessary to impose a punitive measure, providing a fine for non-compliance with the law, in the hope that this would bring complete returns. The matter was referred to in the annual reports of the commissioners of the canal fund for 1846 and 1847.

From the latter report it appears also that the traffic of the Erie canal was increasing year by year beyond the most sanguine expectations of its friends. Inventories of the boats and craft upon the canals were taken at least three times between 1844 and 1848, by which it was shown that the number of boats had increased from 2,126 in 1843-4 to 4,191 in 1847-8, or ninety-seven per cent. There were in use at this date the following: 62

"packets" of 31 tons average; 621 "line boats" of 68 tons; 736 "lake boats" of 67 tons; 319 "bull-head boats" of 72 tons; 1,095 open "scows" of 65 tons; 1,358 decked "scows" of 69 tons; all valued at about three million dollars. The total tonnage capacity had increased from 117,453 in 1843 to 279,260, or one hundred and forty-one per cent, of which ninety-eight per cent was in 1847, practically after the resumption of the work of enlargement.⁵⁰

Governor Young, in his message of 1848, advised the Legislature that the canals had yielded the enormous revenue of \$3,473,484.60 for the previous fiscal year, with expenses of \$643,766.08, leaving a surplus of \$2,829,718.52. Out of this were taken contributions to the various constitutional sinking funds, under article 7, to the amount of \$1,850,000, leaving \$979,718.52, constitutionally pledged to the Erie enlargement, and the Genesee Valley and Black River canals. This entire balance had been appropriated by the Legislature of 1847. The Mexican war was then in progress, with its expenses, and the President, in the line of economy, had vetoed the river and harbor appropriations for the Great Lakes. This naturally interfered with the free development of lake traffic coming to the canal, and called forth criticism from the Governor, who, however, took an optimistic view of the situation and urged forward the completion of the enlargement.

Reviewing the canal policy of the past twelve years, the Governor gave utterance to significant words, which show how the financial situation was viewed so soon after the stringent conditions that induced the stopping of all active operations. After speaking of the necessity which prompted the enlargement of the Erie, he said: "In 1836 the State engaged in the construction of the Black River canal, to connect Lake Ontario and the Erie canal, through a broad region deprived of facilities of access to market; and also the Genesee Valley canal, designed to connect the head waters of the Ohio with the Erie canal, and make its trade tributary to New York.

"The estimated cost of all these works, submitted by the proper department, was \$15,475,201. The work was prosecuted, with quite inadequate appropriations, till 1838, when, by an elaborate

⁵⁰ *Senate Documents*, 1848, No. 50.

examination of the financial condition of the State, made by a committee of the House of Assembly, it was shown that the works might be prosecuted more vigorously, because, while they were estimated to cost only about fifteen and a half millions, the revenues of the canals alone were such that, if necessary, the State might expend thirty millions of dollars, and receive full reimbursements of that sum from the canals before 1857; or even forty millions, if necessary, and be reimbursed from the same revenues before 1865, without the resort to any tax, or the diversion of any of the other revenues of the State. This calculation was based on an estimate of such a constant increase of revenues from all the canals that in 1849, ten years after the completion of the enlargement, the revenues of the canals would reach three millions of dollars. This estimate, not only in its comprehensive results, but in its minute details, has been subjected to the test of time. The enlargement has not been completed, and the year 1849 has not arrived, but the calculation has been fully verified, and the tolls have already reached to nearly the sum of three and a half millions of dollars. The State adopted, in 1838, the more vigorous policy, based on this calculation, and pursued it until 1842, notwithstanding the discovery was made, in 1839, that the cost of the canals, instead of fifteen and a half million of dollars, as at first estimated, would rise to the sum of thirty millions four hundred and forty-five thousand five hundred and eighty-seven dollars. It is now clearly seen, by the demonstration of time and experience, that if the State had firmly and prudently persevered in that policy to the end, we should now, without having paid any taxes, or incurred any necessity for taxation whatever, have had free navigation from the great lakes, through Jefferson and Lewis and Oneida counties, to Rome; and from the Alleghany river, through Alleghany, Livingston, and Monroe counties, to the Erie canal and the lakes; and a canal seventy feet wide and seven feet deep, with durable double locks, and firm and capacious aqueducts, from Lake Erie to the Hudson river.

“Thus our great system of inland navigation would have been completed and perfected; the tolls and cost of transportation on the Erie canal would have been greatly reduced; a considerable portion of the expenditure reimbursed; the remaining cost of

these structures would have been discharged in 1857, and the State left in the enjoyment of revenues, even at such reduced rates of tolls, of not less than five millions of dollars per annum. Instead of occupying this high vantage ground, we are now resuming the Genesee Valley canal, which was relinquished after one third of it had been constructed—the Black River canal, suspended, when one-half completed, and the enlargement of the Erie canal, abandoned when nearly one-half of the cost of the enterprise had been paid. We resume these works after having paid about half a million of dollars of damages to contractors—after having lost for five years the interest on more than fifteen millions already expended, and incurred unascertained losses from the waste of materials and the dilapidation of unfinished works and structures.

“But our constituents, with creditable unanimity and enlightened urgency, expect the Legislature will sanction the most energetic efforts that can be made under circumstances so peculiar to complete enterprises which are no longer of merely speculative importance, but have become, through the lapse of time, the advance of the country, and the vigorous rivalry of competitors for the western trade, indispensable to our prosperity and to the maintenance of that high ascendancy hitherto secured to us by the enlightened and energetic policy of our predecessors.”⁷⁰

Comptroller Flagg followed in much the same vein, saying: “The sum actually expended on the enlargement, exclusive of interest paid on money borrowed, is \$12,989,851.76. If the policy of applying the surplus tolls to the enlargement of the Erie canal had been adhered to, the work at the present time would have been much nearer completion than it now is, and the debt of \$10,122,000 for that object would not have been incurred. If the surpluses had been expended annually as they accrued, an economical application of the money would have been made, and a much greater amount of work would have been executed with the same amount of money than was practicable, where jobs to the amount of ten or twelve millions of dollars were going on at the same time.

⁷⁰*Assembly Documents*, 1848, No. 3, pp. 4-5.

"It should be understood, however, that the Legislature of 1835, did not adopt the recommendation of the Canal Board, to apply the whole surplus to the enlargement, but appropriated \$300,000 of the canal tolls for the support of the government, the deficiency of the revenues of the lateral canals being then chargeable to the General Fund. In 1841, these deficiencies were made a charge on the canal tolls, and the payment to the General Fund was reduced to \$200,000."⁷¹

By the terms of the Constitution of 1846, the office of Surveyor-General, which had existed under and since the government of the Province of New Netherland, was abolished and the office of State Engineer and Surveyor created, to be chosen at a general election, to hold office for two years, and to which office none but a practical engineer should be elected. The office then created has been continued to the present day. Charles B. Stuart, of Geneva, was the first incumbent, assuming office on January 1, 1848.

During the last year of Governor Young's administration (1848), canal matters were comparatively quiescent, after the frequent changes of policy of the previous decade. The improvements upon the Erie canal were, however, "progressing as rapidly as the limited constitutional appropriations would permit," in the language of his successor, Governor Hamilton Fish. The money was expended mainly on bringing into use the double locks yet remaining to be completed and on improvements for the better sheltering of lake craft and the transfer of their cargoes at Buffalo and Black Rock harbors. At Buffalo the work had been suspended for a time on discovering an imperfection in the title of certain lands covered by the improvements and deeded by the city to the State, as will be found in detail in the chapter describing the adjuncts of the Erie canal at Buffalo.

The Legislature was evidently desirous of hastening the completion of the line of double locks on the Erie, and sought from the canal commissioners information as to the cost. The latter, however, discouraged this movement, as it would prevent them from making some very desirable changes in alignment and in lock location, which they had planned. They requested authority to relocate certain locks (between Syracuse and Rochester) and

⁷¹*Assembly Documents*, 1848, No. 4, p. 16.

to do the necessary section work to bring them into use, as well as to diminish their number, if deemed best, for economy in maintenance; they also desired temporarily to lengthen locks between Syracuse and Rochester, and to convert Conesus lake into a reservoir for better water-supply.

The commissioners, at the request of a Senate resolution of February 27, 1849, explained in detail the dimensions of boats, locks and prism of the enlarged canal, which were first adopted by the commissioners, and the changes which had since been made. In the law authorizing the enlargement, the sizes of prism and locks were left to the canal board. Surveys and estimates were made and in 1836 the board adopted the plan providing for seven feet depth of water and seventy feet width at surface; the locks were to be one hundred and ten feet between quoin-posts and eighteen feet wide in the chamber. The depth of the original canal, it will be remembered, was four feet, the bottom width, twenty-eight feet, and the surface width, forty feet; the towing-path was two feet above water-level and ten feet wide; earth slopes were one on one and one-half. The first improved plans provided for a bottom forty-two feet in width and the slopes were changed to one on two; the width at top of banks was eighty-one feet, water-surface seventy feet; at a point three feet below surface the width was fifty-eight feet. Upon each side of the prism was what is termed a bench, upon which a slope wall was built, to prevent the wear of the banks by the swell caused by passing boats. This wall was carried one foot in perpendicular height above the surface of the water, and the banks were raised with earth two feet above the top of the wall. By this plan there was nothing in the angle of the towing-path to prevent the earth above the wall from being carried into the canal by the towing-rope. This method of construction obtained until work was stopped in 1842. As the benches and bench walls were the cause of so much trouble and expense in their removal in later years, it will be well for the reader to refer to the diagrams of sections, shown in Part Two of this volume, that a clear idea of the construction may be had.

Experience had demonstrated that the towing-path had become worn down to the slope wall and the earth moved by the towing-rope into the canal. The slope was thus toward the

prism and the loose earth was washed in. Even stone curbing was tried and frequently thrown out by the towing-rope. It will be observed that by this change the difference in surface width was thirty feet, while the bottom width was increased only fourteen feet. Thus the navigable width for boats drawing six feet of water was but forty-six feet. A comparison of diagrams will at once show that the capacity of the enlarged canal for boats of six feet draught was but little increased over that of the old canal for boats drawing three and one-half feet; and that in neither case could three loaded boats pass at the same time. Boats of light draught would readily ground on the bench, if nearer than fourteen feet to the top of the bank, especially when the water was lowered at night. Frequent slides of the bench occurred, carrying the wall with it.

In 1848, therefore, the commissioners adopted a change of plans, in which the top width between banks was seventy-five feet; at water-surface, seventy feet; at three feet below surface, sixty-two and one-half feet; and at bottom, fifty-two and one-half feet. Another reference to the diagrams will show that a somewhat different section, with steeper banks, was adopted for the eastern division. The towing-path slope wall was carried to the top of the bank, with paving in the rear of the top stone, thus passing the towing-rope without damage. The towing-path sloped so as to drain away from the canal. Three boats, drawing six feet of water, could pass abreast and approach much nearer to the bank. This increased the canal capacity nearly one-third; was easier, safer and required less repairing.

In regard to locks, the commissioners stated that those of the old canal were 90 feet by 15 feet, both at top and bottom, admitting boats 78 feet long by 14 feet 6 inches beam. The enlarged lock was 14 feet 8 inches wide at bottom; the side walls were beveled or sloped to a point three feet above the miter-sill; from this point the walls were battered one-half inch to the foot, so that at a point 7 feet 8 inches above the bottom the chamber was 18 feet wide. Of the 110 feet length, 7 feet 9 inches were allowed for the upper miter-sill and bumping timber, reducing the length to 102 feet 3 inches. Of this space, the lower gates, when being opened to pass a boat out, would

occupy, when one-fourth opened, 3 feet 8 inches; when one-half opened, 5 feet 6 inches; and when three-fourths opened, 6 feet 5 inches, leaving room for a boat 95 feet 10 inches long; if sharp forward, 96 feet 9 inches, and if of packet form, 98 feet 7 inches. Evidently the boats best modeled for easy towing and capacity, and calculated to draw within a foot of the bottom, could not be more than 15 feet 6 inches in width, unless the bevel was removed, in which case boats could be 17 feet on bottom. Why this form of lock was adopted, with its beveled and battered walls, the commissioners of 1849 could not tell, but they supposed it was for the purpose of bracing the walls from within. However, they said that an examination of old lock walls, built twenty-five years before, showed no displacement below water-line, only failing where frost affected them. The commissioners were then authorizing locks without bevel, and intimated that the "big bevel" would require to be removed at some future period.⁷³

In the report of Charles A. Olmsted, eastern division engineer in 1850, further reference to the "big bevel" may be found. Changes in boat-building had progressed more rapidly than the canal enlargement. Navigators had learned to regard burden rather than speed in modeling their craft. Mr. Olmsted said that in 1836, at the beginning of the enlargement, the engineers, in examining the effect of the old lock walls upon their foundations, where part had been removed for repairs, found that the bank-pressure at the rear had tipped the tops forward, making a chamber narrower at the top and indenting the foundation plank beneath the face in proportion to the inclination. To secure a broader base and avoid this difficulty the "big bevel" was adopted. Boats built after the model then in use (1850) were of seventeen and one-half feet beam at bottom, and, of course, could not draw more than four feet of water unless the bevels were removed. On the Black River canal the bevels, so constructed, had been removed at the cost of fifty dollars per lock. It was believed that on the Erie canal they could be removed for about one hundred dollars per lock.

During the season of 1849 an epidemic of Asiatic cholera swept over the state, which was fatal to thousands of its people.

⁷³*Senate Documents*, 1849, No. 50.

This interrupted commercial business to some extent and diminished transportation, yet the receipts from canal tolls increased nearly a quarter of a million dollars. Cazenovia lake was brought into use, temporarily, as a reservoir during this year. The surveys begun the previous year for the remaining enlargements were continued. In order to pass sufficient water east to Montezuma, the commissioners caused a special examination to be made by Engineer Henry Tracy. From his report the commissioners adopted an increased size of prism, one hundred feet in width at water-surface by eight feet deep, at what was termed "the mountain ridge," west of Lockport.

By an act, passed April 3, 1848, the office of canal auditor had been created, and by this action the commissioners were enabled to give more of their attention to other matters and less to details of accounts, as well as to introduce a more perfect system of accountability. The act became effectual at the beginning of the following fiscal year. From his ensuing report it appears that, although the constitutional surplus applicable to canal improvements in 1849 was but \$907,102.71, the appropriations for such purposes were \$1,200,000, of which the Erie (by chapter 217) was to receive \$920,000, and the Black River and Genesee Valley canals \$140,000, each.

Shortly after the "Stop law" of 1842 went into effect, the sheriff of Monroe county destroyed, as a public nuisance, the eighteen-inch feeder dam across the Genesee river just above Rochester, from which water had been used occasionally in emergencies since the canal was constructed. The mill owners of the city protested vigorously against the further use of water from Genesee river for canal purposes and the Legislature took no action to have the dam restored. In view of the constantly increasing need of water for lockages,—on account of the rapid growth of traffic,—it became necessary to look for an additional supply from other sources. By chapter 222, Laws of 1849, the canal authorities were empowered, whenever they should deem it necessary, to establish reservoirs upon lakes Conesus, Honeoye, Canadice and Hemlock, all lying within the Genesee watershed, to replace, in dry seasons, the amount abstracted from the Genesee river for canal use. Engineer Henry Tracy was employed to make the necessary surveys and estimates for the

undertaking, and his report, declaring the project feasible, was attached to *Senate Document No. 40*, 1850. Mr. Tracy was also instructed to prepare plans and estimates for obtaining an adequate supply for ordinary use from Lake Erie, by means of increasing the size and grade of the prism as far east as Montezuma. His report upon this branch of the subject appears as *Senate Document No. 41*, 1850.

Again in 1850 Governor Fish said that the Erie enlargement, as well as the Genesee Valley and Black River canal improvements, were "progressing as rapidly as the limited constitutional appropriations would permit." And the canal commissioners of that year stated that the value of the canal traffic had reached and passed the total value of the domestic exports from the United States for the previous year.

The canal auditor called attention to the fact that the tolls on passengers and on packet boats were rapidly diminishing under the competition of the railways, which paid no tolls on passengers and, with their more frequent trains, increased speed and reduced fare, were drawing this important source of revenue away from the canals. In this same line the Assembly canal committee reported favorably on petitions to remove tolls on property carried by the railroads. They recommended the repeal of the law requiring tolls on freight carried in January February and March, and a further modification of tolls on live stock, fresh meats, fish, poultry and dairy products.⁷³

In 1849 the project of a ship canal between New York and the West, by way of the Hudson river, Lake Champlain and the St. Lawrence river, received considerable attention. A convention was held at Troy and later at Saratoga. Meanwhile committees explored the Champlain-St. Lawrence link by at least two routes, both using the Chambly canal for most of its distance. One entered the river at Longueuil, just below Montreal; the other, surveyed by John B. Mills, entered at Caughnawaga, nine miles above. The prism was to be eighty feet on bottom and one hundred and twenty feet on surface, and the locks were to be two hundred by forty-five feet, with nine feet of water on the sill, carrying boats of three hundred to three hundred and fifty tons. The St. Lawrence and Champlain Company was formed

⁷³*Assembly Documents*, 1850, No. 131.

and the matter of enlarging the Champlain canal to correspond came before the Assembly of 1850, but the canal committee reported adversely on the following grounds: that the cost would be \$3,000,000; that the State revenues were already pledged for a term of years; that the constitutional limit of indebtedness, and the uncertainty of the completion of the Canadian portion rendered the project inadvisable.⁷⁴

In 1850 the commissioners of the canal fund estimated the surplus revenues, applicable to the unfinished canals, to amount to \$942,000. Of this amount \$202,425.78 had already been appropriated, leaving \$739,574.22 at the disposition of the Legislature of that year. From this amount the Legislature appropriated \$654,000 for the Erie canal (chapter 354), with instructions to complete the enlargement at Brockport, Albion and Medina by April 1, 1852, also additional sums of \$120,000 for the Black River canal (chapter 220) and \$170,000 for the Genesee Valley canal (chapter 192). These appropriations from the surplus revenues footed up to \$944,000, and at this point were \$338,250.13 beyond the actual revenues, leaving that amount to be taken from the revenues of that fiscal year.

From the beginning of 1851 the canals became involved in a financial and legislative turmoil that continued until the enlargement was completed. In his annual message to the Legislature of 1851, Governor Washington Hunt urged a more vigorous canal policy and pointed out three distinct modes by which the speedy completion of the enlargement could be accomplished. By the first it was proposed to obtain the necessary funds by an issue of stock certificates, transferring absolutely, in advance, at the purchaser's risk and for a sufficient number of years, that portion of the canal revenues which were devoted by the Constitution to the enlargement of the Erie canal and the completion of the Black River and Genesee Valley canals. This manner of disposing of the surplus revenues was thought by some of the ablest jurists to be within the competency of the Legislature. The second plan was to authorize a loan under the twelfth section of the financial article. However, before a law for this purpose could take effect, it would have to be ratified by the people, and moreover, the Constitution required that

⁷⁴*Assembly Documents*, 1850, No. 129.

every such law should provide for collecting a direct annual tax to pay the interest. The Governor considered that to impose a direct tax would be unjust and that no reasonable excuse could be given for such action, inasmuch as the canals continued to yield a rich return and these revenues were fully adequate to pay interest on the cost of improvements. The third resort was an amendment to the Constitution. The Governor pointed out that, if this amendment should be adopted at once, should be approved by the succeeding Legislature and then sanctioned by the people, the loan could not be secured until the Legislature of 1853 had assembled.

The first of the three plans of the Governor, outlined above, met with favor in the Legislature, but the whole question of canal policy was one of bitter controversy. The bill for the completion of canal improvements, embodying the "revenue certificate" plan, having passed the Assembly, its opponents in the Senate resorted to every known artifice of parliamentary tactics to prevent its passage there. As a last resort some twelve of the opposing Senators resigned, leaving the body without the constitutional quorum for the passage of this and other important legislation, including the usual appropriations for the support of the Government. In this emergency, after adopting a concurrent resolution calling upon the Governor to convene a special session, the Legislature adjourned.⁷⁵ On April 19 Governor Hunt issued a proclamation calling such special session for June 10, at which session the measure became a law (chapter 485).

The question of the constitutionality of the act seems to have been raised at the outset. The Assembly committee, to which Governor Hunt's plan was referred, presented an elaborate report in favor of the measure, supported by the opinions of several eminent jurists. Upon its reference to the Senate, that body, by resolution, sought the opinion of the Attorney-General. In unrestricted terms that official condemned the bill as unconstitutional. But the subsequent favorable report of the Senate committee was buttressed by the opinion of no less a person than Daniel Webster, the Sage of Marshfield. Webster's well known

⁷⁵*Senate Journal*, 1851, p. 618.

sentiment, that "a national debt is a national blessing," may throw some light upon his point of view.

This act empowered the Comptroller to sell "canal revenue certificates" to the amount of \$3,000,000 during the first year, a like amount the second year, and so much of a like amount the third year as the canal board should consider necessary for the completion of the canals in question. Restrictive clauses were inserted to prevent frauds in the unlimited issuance of the certificates, and it was provided that the contracts for the completion of the whole work should not exceed by more than ten per cent the estimates given—\$10,508,141. No guaranty of the State was behind these securities. Only the net revenues of the canals were involved and the general credit of the State was not in anywise pledged, nor was any debt or liability against the State created. This was obviously to avoid conflicting with section twelve, article seven of the Constitution, as it then stood.

This law was subsequently known as the "Nine-million act," because of the specific amounts authorized to be issued under its provisions, aggregating that sum. It should not be confused with another and much later nine-million proposition, which came into existence in comparatively recent years.

The subject of canal tolls on railroads had an important place at this time. The canal auditor, through the commissioners of the canal fund,⁷⁶ sharply warned the Legislature of the probable diminution of receipts from railroad tolls in future. The existing exemptions upon meats and live stock, the consolidation of certain short toll-paying lines, the completion of the Northern line, which was already diverting trade from the canals, and the approaching completion of the Erie railway, which would contend for the transportation of the accumulated products of the West,—these were factors to be considered. He said: "If, under this powerful competition, our tolls do not recede more than \$90,000 it will be the greatest triumph of our canal policy that has been achieved in its beneficent history." He regarded it as an interesting period in the history of the canals, saying that, hitherto their prosperity had been uninterrupted and no anxiety had been felt as to their in-

⁷⁶*Report of Commissioners of Canal Fund, 1850, p. 9.*

creasing value and usefulness. Now the situation required wise and expeditious action to maintain and perpetuate their value.

Legislative committees also were grappling with the question of railway tolls at this time, and numerous solutions were offered. To a select committee of the Senate were referred petitions for a law to equalize tolls upon all the trunk lines, petitions to impose tolls on the Northern and the Erie railroads, as well as others to exempt the Central lines from tolls. The committee was divided in opinion and presented individual reports, most of which foreshadowed the coming abolition of tolls.⁷⁷ The same Legislature, which, with extreme difficulty and in the face of the most strenuous opposition, passed the measure providing for the early completion of canal improvements, in order that the canals, in their improved form, might successfully compete with the railways, which were taking their business away from them,—this same Legislature deliberately passed an act (chapter 497), which released the railways from the necessity of paying any tolls whatever to the State thereafter.

After the lapse of more than half a century since the passage of this act, a broader and more comprehensive view of its results may be taken, than would have been possible at an earlier date. The rapid and unprecedented growth of our State since that period—in population, wealth and power—making it in very truth the Empire State, are matters of public history, more or less familiar to us all. Nor can the mighty influence of our railway systems in that development be gainsaid, and without doubt the State has been enriched many fold by the power thus given to the railroads of becoming essential factors in the greatness of her prosperity and upbuilding. Yet it may well be doubted whether any single legislative act from that day to this has been fraught with graver, more far-reaching consequences to the canals of the state than this act of July 10, 1851, “to abolish tolls on railroads.” By it the Legislature gave to the railways redoubled power as competitors for the traffic of the canals—the “people’s own highway.” The railways could now make better rates for quicker transit—advantages, which they were not slow to grasp. Prior to its passage, the people controlled the situation. Notwithstanding the unwisdom, at various times, of

⁷⁷*Senate Documents*, 1851, No. 38.

the State's financial policy, so closely had this policy been interwoven with that of the canals,—their improvement and their administration,—that it still remained a fact that the golden stream of their revenues, coming largely from the increasing traffic of the West and from beyond the borders of the state, was enriching its people beyond all other sources, building up the state, paying not only the cost of the canals and their improvements, but the general expenses of the State government, rendering direct taxation for this latter purpose in previous years the exception rather than the rule. But recently the power of the Legislature to misapply the revenues of the State had been wisely curbed by constitutional provisions, under which payment of its debts was reasonably assured. However, its framers could not have foreseen this loophole, which was to hinder and delay, if not to frustrate, their well-considered plans.

In after years the railways, in the full tide of their opulence and power, gratefully repaid this generous gift of the people by cutting summer and raising winter rates to a point which has more than once driven the boatmen—partners of the State—from the canals, by combinations, trunk line pools, and “differentials,” as will be shown later on. It has been claimed that the act was passed in the interests of “free commerce” to the traffic which sought the markets of the State. Be that as it may, it has been also claimed⁷⁸ that every dollar of the subsequent canal debt and of the millions which have since been raised by taxation upon the people for its payment—principal and interest—were the results of this act.

The idea of lengthening certain locks, eight in number and lying between Syracuse and Rochester, in such temporary manner as to bring them into use, pending the completion of the entire canal enlargement, had been considered by the canal board for several years prior to this time, and in 1849, by chapter 233, authority had been given them to do so. This would permit the lengthening of boats, increasing their tonnage and the canal traffic at slight expense. Rochester interests demanded such action, and the State Engineer advised the canal board not only to lengthen the locks, but to make them of full width, in order to

⁷⁸*State Engineer's Annual Report*, 1878, p. 14.

bear the traffic of the enlarged canal at once. The board submitted this plan for legislative approval on February 18, 1851.⁷⁹

After the passage of the act of 1851 for finishing canal improvements, the canal board in July ordered complete plans and estimates to be prepared and the State Engineer caused test lines to be run and a careful review of the estimates to be made along the entire line. These were completed October 10. Finding the results to be within the estimates submitted to the Legislature, the canal board advertised for letting the whole work, which by the law was to be completed by the first day of May, 1854. The bids were closed on November 8, there being over 2,600 separate proposals, which required twelve days for canvassing. For this reason the year 1851 was afterwards known in canal circles as the year of the "big letting." According to the canal commissioners' report,⁸⁰ a summary of the whole would stand as follows:

Cost of work as reported to the Legislature...	\$10,508,141.00
Add 10 per cent, as stated in the law.....	1,050,814.00
	<hr/>
	\$11,558,955.00
Cost of work at contract price	\$8,029,727.45
Add 10 per cent for contingencies	802,972.74
	<hr/>
	\$8,832,700.19
Contract price less than the estimate.....	<hr/>
	\$2,726,254.81

Meantime the Comptroller had, under the provisions of this act, issued six per cent certificates during the last half of the year, to the amount of \$1,500,000. A small premium was realized from their sale and a portion of the proceeds was used in payment for work already under contract.

During the year and subsequent to the estimates on which the appropriations had been based, numerous changes of location were made under authority of the canal board, principally on the middle and western divisions. By these changes the line of the western division was shortened about eleven miles, but the expense of construction was somewhat increased. The question

⁷⁹*Assembly Documents*, 1851, No. 66.

⁸⁰*Assembly Documents*, 1852, No. 33, p. 78.

of an independent line east of Rochester had long occupied the attention of the State officers in charge of the canals, and in the report of 1850 Division Engineer Stillson had urged important considerations in its favor, estimating its increased cost over the expense of enlargement on the old line, however, at \$189,000, although the distance would be shortened by six and a quarter miles. New surveys and estimates were again made, and the whole question was carefully considered, resulting in the adoption of the independent line. The principal changes were made between Macedon and Rochester, at Holley and just east and west of Lyons. The plans, however, were again altered in 1854, as we shall notice later.

It was estimated that at this period (1851) there were in use on the canals 4,047 boats, of 70 tons average, or 283,290 tons in all.

The amount derived from canal revenues for the fiscal year to October 1, 1851, was \$3,722,163.11, being an increase of \$235,990.08; the available surplus for improvements was \$964,432.91; the increase of tonnage was still larger, rates on flour and wheat having been reduced 25 per cent.

The enactment of the "Nine-million" law of 1851 and the subsequent issue during the year of a million and a half of "certificates" under its provisions, did not by any means settle the bitter controversy which had attended its passage. The arguments used by its opponents as to its constitutionality had not been forgotten. The question of whether or not the canal improvements should be completed was not at issue, this being conceded universally. The dissension was concerning the method by which the necessary funds were sought to be raised for their completion. Nor did the circumstances surrounding the "big letting" in December tend to allay the strong feeling that existed concerning the law. "The unprecedented course of some of the representatives of the people to defeat it," says the report of a legislative committee, "the special election ordered in consequence—the excitement attending it—the extra session of the Legislature to carry out the expressed popular will—the magnitude and importance of the improvement, and the immense amount of work requisite for its completion, all conspired to attract and concentrate the attention of the public, and espe-

cially of all who hoped directly or indirectly to profit by its execution, upon the measures taken for its accomplishment.

"Accordingly when, after due notice had been given for the receipts of proposals for the entire work on the Erie, Genesee Valley, Black River and Oswego canals, the Canal Board . . . proceeded to open and examine the same, a scene was presented unparalleled in the history of the public works of the State. From all parts of the State, from other states, from all walks of life—from every profession, pursuit and trade—from every division and sub-division of political sects, there swarmed upon the Capital a legion of applicants, all anxious and importunate for a participation in the anticipated profits of some share in this improvement, the last for many years at least, to be obtained upon the public works of the State. The expectations of all ran high. Some had claims real or imaginary for political services. Others relied upon personal friendship for success, while others destitute of such recommendations, resorted to other and less creditable means to secure a favorable consideration. Associations, combinations and partnerships were formed, almost without numbers, and embracing components of every conceivable complexion, for the purpose of securing, in the name of some of them, a share in the contracts.

"While this was going on outside, the Canal Board was busily engaged in canvassing the bids and preparing their proposed allotments of the work." The number of bids was said to aggregate about \$400,000,000, and the number of bidders about 3,000. The graphic description continues: "The Board at once saw and felt the difficulty of awarding the work in such a manner as to give satisfaction generally to the host of applicants; and to add to the difficulty, jealousies existed in the minds of some of the members of the Board itself, as to the designs of other members, whom they suspected of an intention to bestow the contracts upon their political associates."⁸¹

It was understood that "the law, sanctioned by all experience, had repudiated the idea of letting the work to the lowest bidder, which made united action on the subject by the Board a task of increased difficulty, and rendered it still more necessary to have some general understanding between the members of the Board.

⁸¹*Assembly Documents*, 1852, No. 89, pp. 9-10.

. . . It was conceded, too, after the first meeting of the Board, that the work should be equally divided [between] the democratic and whig bidders, without regard to their being the lowest bidders."⁸²

Within a few days after this remarkable "letting," the Legislature of 1852 began its session. "Coming events cast their shadows before," and when Governor Hunt, in his message, felicitated the Legislature and the people upon the adoption of the certificate plan and the prospect of immediate completion of the improvements contemplated, it is to be noted that he also advised the Legislature to keep in view the actual condition of the treasury and to limit their appropriations within the reliable revenues of the general fund. He said that the annual contributions to the sinking fund required by the Constitution were shown to be sufficient to discharge the State debt in about seventeen years; after that the entire revenues could be used to pay the certificates then being issued.

The toll rates upon wheat and flour having been reduced, the Comptroller raised the pertinent question as to whether the State, having pledged its canal revenues for a term of years by the act of 1851, possessed the right to impair the security of the stockholders by reducing tolls, "except to increase trade and revenue."

The constitutionality of the "Nine-million act" having been called into question before the courts, the State Engineer, on January 9, 1852, warned contractors, under the letting of the previous month, not to proceed with work under their contracts, except upon their own responsibility. An adverse decision of the courts being feared, various measures of relief were proposed. In the Senate it was sought to have the Constitution amended so as to permit a loan of \$9,000,000 to complete improvements. Another resolution to borrow \$6,000,000 was tabled. Another to provide for \$7,000,000 "in case the law of 1851 should be declared unconstitutional by the Court of Appeals."

During the legislative session of 1852 the circumstances attending the big letting were thoroughly reviewed. In the Assembly it was openly charged that several members of the canal board had met secretly at the house of Peter Cagger in Albany, prior to the

⁸²*Assembly Documents*, 1852, No. 89, pp. 11 and 24.

letting, and agreed on an allotment of canal contracts on the basis of political considerations and favoritism, and not to the lowest bidder. The canal board presented a formal request⁸³ to both branches of the Legislature for an inquiry as to the conduct of the board, the commissioners, the state engineer and his division engineers, who had had to do with the big letting in the award of contracts, and as to their acts generally in the discharge of their duties. A joint legislative committee of five, composed of Senators Conger and Upham, and Assemblymen Moss, Cushing and Bull, were appointed under concurrent resolution "to examine and report within one week whether any and what action the legislature should take, in the matter."

A large amount of testimony was taken by this committee, which appeared in a volume of some 1,200 pages as *Assembly Document No. 89*, 1852. The majority report frankly admitted that the contracts were in fact apportioned fairly between the two political parties, and vigorously defended such a course as being the only practicable method under the circumstances. They advanced the interesting argument, previously spoken of, that "the law, sanctioned by all experience, had repudiated the idea of letting the work to the lowest bidder, which made united action on the subject by the Board a task of increased difficulty, and rendered it still more necessary to have some general understanding between the members of the Board." The minority report followed, modified in its conclusions and claiming that blame, if any, should attach to the defective law, which "did not require, but rather forbid the letting of the work to the lowest responsible bidder. . . . These results were confidently predicted by the opponents of the law at the time of its passage. . . . It is the duty of the State to carry out the contracts in good faith, to make the best of an inconsiderate law, and see that the enlargement is duly prosecuted."⁸⁴ The chairman of the committee, Senator Conger, presented a further minority report, signed only by himself, which was in effect a stinging denunciation of the State officials concerned.

The canal board, by resolution in February, requested the Legislature to pass an act to submit the question of the validity of

⁸³*Senate Documents*, 1852, No. 8.

⁸⁴*Assembly Documents*, 1852, No. 89, pp. 11, 25 and 27.

the contracts in question to the Court of Appeals. The Assembly judiciary committee reported⁸⁵ adversely upon the proposition to ask that tribunal to forestall its own judgments on appeal. The Court of Appeals, however, had the matter already under consideration in another and less startling form. One of the certificates under the law of June 10, 1851, having been issued and presented for payment, the canal auditor refused to draw his warrant for its payment. The matter was then brought into the courts and in May of 1852 the Court of Appeals rendered its decision, saying, "The act, July 10th, 1851, directing the borrowing, upon interest, of nine millions of dollars upon canal revenue certificates, payable out of the future surplus revenues after the completion of the canals and providing for the application of the whole sum to the completion of the canals within three years, is repugnant to the constitutional provision that the remainder of the revenues of the canals shall, in each fiscal year, be applied to the completion of the canals until they shall be finished; and also to that provision by which a power is given to the Legislature to apply the remainder of the revenues to the general expenses of the government, immediately after the completion of the canals."⁸⁶

The State Engineer at once notified all contractors under the act, upon which this decision had been rendered, to stop work, and directed his subordinates to "measure up."

In August, 1852, plans were submitted by the State Engineer to the canal board for the temporary enlargement of the old locks between Port Byron and Rochester, to permit boats of enlarged size to pass the whole length of the canal; also plans to bring into use, with four feet of water, the enlarged canal between Port Byron and Montezuma, and for raising the banks for five feet of water on the whole canal wherever not enlarged.

The commissioners subsequently reported that during the year trade had been seriously embarrassed from the "wedging" of boats in narrow and unenlarged sections, the original canal width being 40 feet at surface and 28 feet on bottom, and most of the boats at this time being constructed fourteen feet six inches "over all" at the head of the floor timbers, and by the regulations

⁸⁵*Senate Documents*, 1852, No. 15.

⁸⁶*Newell v. People*, 7 N. Y. 9. (Note, *Abb. Dig.* Vol. 3, p. 600.)

being entitled to half the canal in passing. It followed that boats of the old size were not in sufficient numbers to carry the traffic, while the building of new enlarged boats was deferred from uncertainty as to when they could be brought into use.

During the season of 1852 extensive surveys were made throughout the western division, both for the purpose of correcting and improving the alignment of the canal and also for increasing the width of the prism and its grade, so as to promote a more rapid movement of feed-water from Lake Erie to Montezuma, thereby obviating the necessity of using so much water from the Genesee river at Rochester for purposes of feeding, as has been explained.

In his message to the Legislature of 1853, Governor Seymour said: "When it was decided in 1835, to enlarge the Erie canal, it was proposed to accomplish the work by the application of the surplus tolls, without resorting to loans. There has been collected from taxation upon the transportation of property upon our canals, since that time, the sum of \$41,227,000; the expenses of keeping them in repair amount to \$11,459,000. The balance might have been applied to the completion of our public works if we had created no debts involving charges for interest and Sinking Fund accounts; it is believed that the balance of \$29,768,000, if it had been applied as it accrued from the revenues, would have finished the works; the estimate of their cost was \$30,734,000."⁸⁷ This view was very similar to that of Governor Young in 1848, before mentioned.

He said further that, unfortunately, the Legislature of 1851 rejected a proposed amendment, providing that the constitutionality of the law should be determined before letting contracts or borrowing money. Certificates were sold for less than one per cent premium, while State stocks of known constitutionality commanded a premium of from nine to sixteen per cent. Contracts were let, nominally amounting to \$8,029,727.45, but no allowance was made for extra, if quicksand or hardpan developed. He explained that it was not necessary, as had been claimed, to complete the entire enlargement to enable boats of full size to pass. The improvements already made had doubled the capacity of the canal. The average tonnage, when the canal was built,

⁸⁷*Assembly Documents*, 1853, No. 1, pp. 20-21.

was 40 tons; in 1844 it was 64 tons; in 1852 it was 90 tons. With lengthened locks, boats with 120 tons could pass from end to end; and with \$400,000 expended in deepening the water, new boats could carry 150 tons. About 150 miles of enlargement were then completed. The points of least capacity limited the size and tonnage of the entire length. Removing the obstructions at these points would practically increase the capacity of the whole canal. As to the western end and the problem of the Genesee river feeder, enlarged boats would diminish the number of lockages and the amount of water used. The early enlargement of the canal between Buffalo and Rochester would entirely obviate this difficulty. It was important to have large boats go through. Builders wanted to build boats of full size and were waiting, while boats for use were scarce. As to the competition of the railways—released from tolls—it was necessary to reduce canal tolls to meet it.

From the financial point of view, the Governor thought that the application of a million dollars per year for six years to come would solve the difficulties of the canal problem. He did not believe that the surplus tolls would suffice to do it, but the balance could be raised by tax, or borrowed under the provision of section twelve, article seven, of the Constitution, for a term of eighteen years, with a tax for the interest and a sinking fund, or a loan could be sanctioned by a constitutional amendment.

As between taxation and a constitutional amendment, the certificate plan having failed, the canal commissioners favored the amendment. They thought that, in framing this, the money could be borrowed on a pledge of the revenues, after the discharge of the existing constitutional obligations as to the surplus, or the latter could be postponed with great advantage to a distant day, and the canal revenues applied directly to their completion. The latter plan was to be preferred, for the reason that statistics had been prepared, showing the gradual diminution of local tolls and the corresponding increase of through or western tolls for the previous five or six years. Obviously, the longer payment was delayed, the greater would be the proportion paid by people of other states.⁸⁵

⁸⁵*Assembly Documents*, 1853, No. 23, p. 147.

Commissioner Fitzhugh, of the middle division, submitted to the Legislature his special views concerning methods of economical canal administration.⁸⁹ He believed that the same amount of work, directed with the care and economy controlling individual enterprises, could have been accomplished for about half the sum it had cost the State. He said that the canals had been so long deemed a legitimate engine of political warfare, that inherent evils in the existing system of superintendency and repairs had enormously multiplied. He recommended, as a sure remedy, the "Contract system" of repairs, by sections, on a three- to five-year basis. As a matter of history it may be noted that this system was subsequently adopted (chapter 327, Laws of 1854), and will receive its due share of attention in regular sequence.

The canal commissioners, referring to the year 1852, said that, while there had been a large increase in business, the receipts had fallen off some \$200,000. The removal of railway tolls, which went into effect December 1, 1851, rendered it necessary to make large reductions on canal tolls, to compete successfully with the railways. They believed that the receipts from tolls were diminished, in consequence of this competition for the year, by at least \$500,000. This statement confirms the one we have heretofore made as to the effect of the act of 1851.

In his annual report for 1852, the canal auditor called attention to the "anticipatory" expenditures, which had been made since 1847, and which have been noted before. In each of the six years, as he said, the expenditures had exceeded the appropriations by from \$35,000 to \$246,000, or in the aggregate, \$822,487.56. This had been sharply called to the attention of commissioners and superintendents, but it still continued, although it was a plain violation of section 8, article 7, of the Constitution, and the auditor said that he must either draw warrants in excess of appropriations, as had been the custom, or the canals must be closed in August following.

Continuing, the auditor said that, while there had been an apparent reduction of canal debt since the adoption of the Constitution, new debts had been created, payable from the sinking fund, to more than balance the reduction, and that the sinking fund had failed of its purpose. After the expiration of six years,

⁸⁹*Assembly Documents*, 1853, No. 23, p. 188, *et seq.*

or nearly one-third of the entire period, the obligations of the State for canal purposes were now larger than when the sinking fund was established, notwithstanding the constitutional mandate concerning the "sacred" application of the sinking fund to the payment of the canal debt.

A legislative committee appointed to examine into the accounts of canal officials found that the expenditures for repairs during the year 1852, and especially upon the eastern division, had increased several hundred thousand dollars over the previous year, and so reported.⁹⁰ This resulted in reducing the estimated surplus applicable to improvements, from \$800,000 to \$300,000. On the eastern division extravagant expenditures were said by the committee to have been incurred, which were entirely unauthorized by the canal board and in violation of the Constitution. One of the undoubted results of this arraignment of official frailties was the subsequent passage of chapter 52, Laws of 1853, requiring thereafter the monthly publication of abstracts of superintendents' payments.

The canal commissioners, replying to an inquiry, advised the Legislature that work had been done on contracts under the "Nine-million act" to the amount of \$131,275.74, up to the close of the year 1852.⁹¹

The canal committee of the Assembly, speaking in its report⁹² of the manner in which the expenditure of the surplus revenues had been annually "anticipated" by previous Legislatures, took the broad ground that this course was forbidden by the Constitution; that the Legislature, in each year, could determine only the "manner" of its expenditures; and that prior debts formed no lien upon the current surplus revenues. The committee also urged the adoption of a modification of the "improvement" plans, for temporary use, in consideration of the practical completion, in June following, of a line of locks on the Erie canal, enlarged to admit boats of 250 tons. They said that the only difficulty in the way of using the enlarged boats at once was the want of width and depth of channel. On the eastern, the most important division, bearing the additional traffic of four of

⁹⁰*Assembly Documents*, 1853, No. 8.

⁹¹*Assembly Documents*, 1853, No. 18.

⁹²*Assembly Documents*, 1853, No. 64.

the most important laterals in addition to its own, the enlargement was nearly completed, and for about half a million dollars an average increase of from three to five feet in breadth and a depth of five feet of water could be obtained, which would permit the use of boats of 150 tons burden. The plan had been approved by the canal commissioners and the State Engineer. Part of this sum, over and above \$130,000, would also be utilized in the permanent improvement of the canal.

The committee expressed their anxiety lest the unrestricted competition of the railways would force a further reduction of tolls, or a diversion of traffic at a time when the canal revenues barely paid the charges against them. The State, they said, possessing entire control of the avenues of trade between the Atlantic and the western lakes, had constructed her canals at immense cost; had granted to companies the right to carry a portion of this traffic; had even transferred to them the right of eminent domain, which many doubted her power to do; and as a last and costly concession, had repealed the law imposing tolls upon them, admitting them to full and unrestricted competition. They pointed out the fact that, if the freedom of this competition was confirmed by failure to provide for corresponding canal improvements to permit larger tonnage and cheaper rates, the railways would establish a basis for their future operations inevitably resulting in much lower rates of transportation, in which competition the canals would be at great disadvantage. Thus early were the fears of those who opposed the bill of 1851, abolishing railway tolls, in a measure justified.

The "Nine-million act" having been declared unconstitutional in the previous May, the issue of \$1,500,000 under its terms required repayment at once. The ways and means committee of the Assembly grappled with the problem, presenting diverse reports;²⁸ the majority advised a direct tax upon the people for the deficiencies apparent, including special taxes on bank circulation and railway receipts, hoping that strong public opinion would compel the administration of the canals along more economical lines for the coming year; while the minority scouted the idea and said that the burden would fall upon the agricultural interests of the state. They advised a constitutional amendment, plac-

²⁸*Assembly Documents*, 1853, Nos. 48 and 54.

ing the revenues where they belonged—for the improvement of the canals. In this attitude they had the support of the chamber of commerce of New York city, which memorialized⁹⁴ the Legislature, urging immediate measures to submit to the people the propriety of amending the Constitution so as to enable the State to borrow money to complete the canals in the most expeditious manner, and stating that they were opposed to taxing railroads, as tending to divert New York traffic into other channels.

On April 5, the Governor, by a special message,⁹⁵ again called attention to the necessity of making immediate appropriations for canal improvements, to enable new boats of 230 tons capacity, but loaded with only 130 tons, to pass, in order to stimulate boat-building to take the place of those annually worn out.

In the way of increasing lake traffic in connection with that of the Erie canal, it may be noted that a charter was granted on April 12, by chapter 180, to Erastus Corning and associates to construct a ship canal at the falls of St. Mary in compliance with the statutes of Michigan and the Federal laws.

Chapter 170, Laws of 1853, chartered the Albany and New Baltimore Ship Canal and Basin Company, to construct and maintain a canal, with its adjuncts, from South Albany along the west shore of the Hudson river, probably for transshipment purposes and for affording an outlet for canal traffic below the shallow reaches of the upper Hudson, in connection with, but not as a part of the Erie canal. This canal was never built.

The Senate passed a concurrent resolution, providing for a constitutional amendment. This encountered opposition in the lower house and, within three days of its adjournment and too late for a conference or for united action, unimportant amendments as to terms and periods of the proposed loan were made. In the arguments bad faith was charged, the canal question having been prominent in the preceding campaign and the Governor and many members having been pledged to promote the speedy enlargement of the canal.⁹⁶

The Legislature, at its regular session, did not directly carry into effect the plan of temporary enlargement, outlined and urged

⁹⁴*Assembly Documents*, 1853, No. 100.

⁹⁵*Assembly Documents*, 1853, No. 91.

⁹⁶*Assembly Documents*, 1853, No. 99.

by the State officials, but by chapter 620 it reinforced the canal fund with \$200,000 from the sale of the remaining revenue certificates (July 20), with \$200,000 of the Oswego canal loan, and with \$250,000, the remainder of the canal revenues for the current fiscal year. From the fund so strengthened it appropriated \$390,000 to the enlargement of the Erie canal, "as referred to in the Constitution of 1846."

The Oswego canal loan, just spoken of, was under the provisions of chapter 501, Laws of 1851, which provided for a loan of \$200,000 in each of the years 1851 and 1852, for the purpose of completing the enlargement of the Oswego canal locks. The first item only had been borrowed.

The repeal of the act of the previous year (chapter 270), for the enlargement of the canals, was rendered necessary by circumstances and was effected by chapter 473, Laws of 1853.

Meanwhile the perennial question of "canal frauds" was occupying considerable time and attention. On March 17, 1853, a select committee of five was appointed by the Assembly to examine into the propriety and legality of the official conduct of certain State officers against whom charges had been made both in the commissioners' current report and by the canal auditor. On April 13 the committee reported⁹⁷ that John C. Mather, commissioner of the eastern division, was guilty of unauthorized and illegal expenditures in connection with improvements at West Troy, and that he stood "impeached for high crimes and misdemeanors."

The session "being likely to adjourn without providing for the preservation of the public faith," as the Governor expressed it, or the interest on the canal debt, the canal improvements, the charges against Commissioner Mather and other important matters, it was convened in prolongation of the regular session, to avoid unnecessary delay and expense, by a message⁹⁸ of the Governor on April 14. He again urged the temporary completion of the Erie canal on the lines of his former message, saying that six hundred thousand dollars, properly expended, would nearly double the capacity of the canal and that delay would be disastrous

⁹⁷*Assembly Documents*, 1853, No. 103.

⁹⁸*Assembly Documents*, 1853, No. 106.

through the diversion of business. If the improvements asked were made, they would in no way interfere with the proposed enlargement. On the contrary, they would hasten that result by increasing domestic commerce, cheapening transportation and augmenting the revenues of the public works. The Legislature, he said, by prolonged discussions and proposed measures, had recognized the importance of completing the unfinished works, but no plan had been adopted for their continued prosecution. Various propositions had been made to raise the necessary funds by taxation and by amendment of the Constitution. At least two amendments had been discussed; one proposed to borrow \$2,500,000 each year, in addition to the surplus revenues, which would swell the annual expenditures to more than \$3,000,000, and increase the debt of the State by \$10,500,000; the other was to borrow annually, for six years, a sum which, with the surplus revenues, would amount to \$1,500,000 and probably create a debt of \$5,000,000, without applying any of it to the payments of the doubtful contracts of 1851.

He said: "The deep feeling excited in the public mind by the canal lettings under the law of 1851, has created a strong opposition to any amendment of the financial provisions of the Constitution, and the differences of opinion in relation to them, have obstructed legislation, and prevented the passage of laws demanded by the interests of our public works."⁹⁹

On the reassembling of the Legislature under the spur of the Governor's call, efforts were made to reach an understanding upon the problem of canal finances. Being unable to agree, a conference committee of the two Houses finally accepted a compromise measure, which became a concurrent resolution,¹⁰⁰ proposing an amendment to the Constitution. From the canal revenues the expenses of maintenance and repairs were first to be met, with the constitutional sums required under the first two sections of article seven; from the remainder, as a sinking fund, a sum sufficient to meet the interest and the principal, within eighteen years, of any loan made under the amendment; after that two hundred thousand dollars was to be set apart for the expenses of State government; the remainder was to be applied

⁹⁹*Assembly Documents*, 1853, No. 106, p. 4.

¹⁰⁰*Session Laws*, 1853, p. 1263.

to meet appropriations for canal enlargement and completion. This remainder was not to be anticipated or pledged for more than a year in advance. Under its provisions, loans could be made for the purposes, not to exceed two and a quarter million dollars in each year, during the ensuing four years. One and a half million dollars was to be borrowed to redeem the certificates of 1851, and contracts thereafter were to be let to the lowest responsible bidder, and no contract debts incurred after June 1, 1852, were to be allowed under its provisions.

Commissioner John C. Mather, of the eastern division, upon whose shoulders much of the previously mentioned criticism fell, put in a vigorous defence¹⁰¹ under date of May 30. While admitting the increase of expenditures for repairs, he claimed that the "false and garbled statements sent forth to the public, all emanating from one source," should be disregarded, and the public, "to whom alone the commissioners were responsible for the faithful discharge of their official duties" should be furnished with a "true statement." He said that the sudden stoppage of work under the act of 1851 added largely to the expenditures for repairs. He claimed that the commissioners were constitutional officers and that the canal auditor was a subordinate officer and not entitled to criticise the commissioners.

Formal articles of impeachment were prepared against Commissioner Mather and presented to the reassembled Legislature. After a bitter and protracted contest in the Assembly, the resolution of impeachment "for high crimes and misdemeanors" was adopted on June 22, by a vote of 80 to 35.¹⁰²

The drainage and reclamation of the Cayuga marshes, through which the Erie canal was located, was of interest to this and the preceding Legislatures. Commissioners had been appointed, who, after examination, advised the removal of a rocky reef known as "Jack's reef" and a bar at Mosquito Point to accomplish the purpose sought.

In 1853 the project of a ship canal to connect Lake Erie with Lake Ontario, which had remained quiescent since the earlier surveys and the completion and operation of the Erie canal, was again brought to the front. Surveys, maps and estimates for a

¹⁰¹*Assembly Documents*, 1853, No. 111.

¹⁰²*Assembly Journal*, 1853, p. 1384.

canal with fourteen feet of water were made under the direction of Chas. B. Stuart, C. E., and Edward W. Serrill, C. E.

In the Assembly also numerous petitions from the inhabitants of western New York were presented, praying for authority to build a ship and hydraulic canal around the falls of Niagara. The Assembly committee presented an adverse report squarely upon the ground that such a project would be detrimental to the interests of the Erie canal, saying: "The trade of the lake region belongs to the Erie canal. It has been created by it, and is a rightful inheritance to it, as much as is the farm of the husbandman to him who has purchased, subdued and brought it into a condition of productive cultivation and consequent value. Your committee contend that the populous and productive States which border the chain of lakes and pour their rich fruits into our markets in such abundance, would have remained to this day in a state of comparative wilderness but for the Erie canal. This State work lifted the borders of civilization from the confines of our own State, and transferred them by gradual approaches to the base of the Rocky Mountains. To it, then, belong the honor and profit of this achievement, and the hand which would divest it of either, possesses a questionable friendship for our adopted system of internal improvements and the common welfare of the State."¹⁰³

Notwithstanding the eloquence of the committee, the Assembly, on July 21, chartered to Hamilton Fish and associates the right to construct a ship and hydraulic canal for ships of 500 tons, under the name of the Niagara Ship Canal Company. The capital stock was limited to \$5,000,000, and the State reserved the right to subsequent purchase at cost with ten per cent added.¹⁰⁴

In reporting for 1853 the Comptroller referred to the sharp decrease in canal revenues and the resulting small remainders for enlargement, attributing it both to the competition of railroads in carrying freights and to increased expenditures of superintendence and repairs.¹⁰⁵

¹⁰³ *Assembly Documents*, 1853, No. 77, p. 3.

¹⁰⁴ *Laws of 1853*, chapter 595.

¹⁰⁵ *Assembly Documents*, 1854, No. 5, p. 25.

From the auditor's annual report¹⁰⁶ we learn that up to this time there had been but two laws authorizing a direct tax for canal purposes,—one in 1842 (chapter 114) and the other in 1853 (chapter 651). Under the law of 1842, \$456,477.35 was collected, and expended in the payment of canal debts, and under that of 1853 the sum of \$621,467 was to be collected for the same purpose. Of this latter amount \$590,000 was for protested canal commissioners' drafts, drawn *after* they were informed that there were no means to pay them, hawked about among money lenders, and sold at a sacrifice by necessitous holders. This had continued until July 20, 1853, and much of it in the face of the Governor's recommendation of January, 1853, that laws should be enacted forbidding the practice.

The auditor also called attention to an extensive system of frauds prevailing upon the canals and of which discovery had been made during the past season. These had been perpetrated by means of false entries upon bills of lading, in collusion with minor canal officials. By an order of the canal board, giving to the collector discovering the fraud a portion of the penalty exacted, much of it had been uncovered and it was hoped that publicity and increasing vigilance would eradicate the evil.¹⁰⁷

In addressing the Legislature of 1854, Governor Seymour urged the approval of the amendment of the year before and its submission to the people at an early date. He again earnestly recommended the temporary improvement of the canals on the lines of his former message, at the expense of about \$500,000. The complete line of enlarged locks between Albany and Buffalo had been brought into use. Enlarged boats, carrying 130 tons, had already passed through and many more were building. He said also that constant watchfulness was required against unnecessary expense of construction and management and that unless rigid economy should be exercised the appropriations under the proposed amendment would be expended without the completion of the canals. Adverting to the unauthorized canal indebtedness of nearly a million, which the State, to save its credit, had been compelled to raise by tax and pay the year before, he recommended a law to prohibit any public officer from continuing expenditures or overdrawing an appropriation, when no funds remained to its credit.

¹⁰⁶ *Assembly Documents*, 1854, No. 10, p. 25.

¹⁰⁷ *Id.* pp. 28-34.

If the law of 1851 had not been declared unconstitutional, said the Governor, it would still have failed in its purpose, as its loans were predicated only upon surplus revenues and its certificates were not salable to advantage and the work would have necessarily been suspended. Under the amendment now proposed the bonds would be based upon the credit of the State and would bring a substantial premium.¹⁰⁸

The constitutional amendment, proposed in 1853, was approved at the session of 1854. In order to facilitate matters an act was passed (chapter 5), under which a special election was held on the third Wednesday in February, at which election the amendment was approved by the people.

Canal measures occupied the attention of the Legislature to a considerable extent, but the results at the close of the session may be noted with much greater brevity than those of the preceding year. A proposition to enable corporations to build and navigate boats failed to receive the sanction of the committee on commerce,¹⁰⁹ for fear of its tendency to injure the individual owners. The Rochester mill owners were again in the field for damage claims for diversion of the water of the Genesee river,¹¹⁰ but we fail to find any statute of the year in their favor.

In response to a Senate resolution of inquiry to the State Engineer and canal board as to the probable cost of the enlargement of the Erie canal and the completion of the Genesee Valley and Black River canals and the Oswego canal locks, specifying the probable amount required on each division, hurried estimates were prepared and submitted,¹¹¹ amounting to \$9,862,592.98, not including, however, the items of engineering, land damages, removal of buildings and miscellaneous expenses. These, with the addition of some omitted items, would bring the estimates up to \$12,993,701.45, and even this sum was considered by the State Engineer to be insufficient to complete the improvements as contemplated by the Constitution of 1846.

In the discussion of bills in the Legislature, some changes and improved methods of letting contracts may be noted,

¹⁰⁸*Assembly Documents*, 1854, No. 3, pp. 23, 29 and 30.

¹⁰⁹*Assembly Documents*, 1854, Nos. 16 and 32.

¹¹⁰*Assembly Documents*, 1854, No. 63.

¹¹¹*Senate Documents*, 1854, No. 109.

one of these suggestions bearing fruit in the passage of chapter 327, which authorized the repairs on specified sections to be let for a term of years under contract, as a test of the system, then newly advocated, which was destined to come into vogue during succeeding years. The formal repeal of the act (chapter 485) of July 10, 1851, embodying the "certificate" plan, and known as the "Nine-million act," was accomplished by the passage of chapter 338, on April 17.

The plan advocated by the Governor and others, and to which we have referred—of the temporary completion of the enlargement—was effected by the passage, on February 15, of chapter 16, which authorized the commissioners to proceed at once to "bottom out" the Erie, the Oswego and the Cayuga and Seneca canals in their narrow and crooked portions so as to admit the passage of boats of enlarged size, drawing three and one-half feet of water. \$115,000 was devoted to this purpose, of which \$100,000 was to be expended on the Erie canal.

Immediately after the passage of the law authorizing the resumption of the enlargement and completion of the canals, vigorous measures were adopted for the prosecution of the work. Under the direction of the State Engineer, new surveys, maps, plans and estimates, covering nearly the entire lines of the works to be completed, were presented and approved by the canal board. The first lettings were held in July and continued from time to time up to the twenty-seventh of December.

Under the authority of chapter 327, Laws of 1854, section 8, near Syracuse, had been put under contract for repairs, on October 1, for three years, at a price forty per cent less than the average cost of repairs had been for the preceding three years. The experiment, so far, seemed satisfactory to Commissioner Fitzhugh—economical, and, as he thought, an "incalculable improvement in public morals."

The supply of water from Lake Erie east as far as the Seneca river, without using that of the Genesee river, had been a canal "problem" since the days of its construction. In 1847 Chief Engineer O. W. Childs, under the canal commissioners, made surveys and recommended an increased capacity. In 1850 Engineer Henry Tracy made another report, recommending a still larger canal, and the canal board adopted a prism of ninety-one

feet wide by nine feet deep at Lockport; thence regularly diminishing to sixty-two feet wide by nine feet deep to a point in the City of Rochester where the mean width of the enlarged canal was sixty-two feet; thence to the Rochester aqueduct sixty-two feet in mean width by nine feet depth of water; thence to the easterly end of the aqueduct as it was then; and thence to the first lock east of Rochester at a mean width of waterway of sixty feet and a depth of eight feet.

In 1854 the State Engineer submitted a plan, in capacity substantially that of Engineer Childs, locating the canal bottom eighteen inches below the miter-sill of the lowest lock at Lockport; thence on a regular grade, dropping two feet, to the bottom of the Rochester aqueduct, with a diminishing prism, and giving a total surface declivity of three feet eight inches.

But the owners of the Genesee water-power succeeded in obtaining from the board a modification, similar to the plan of 1850, except that the bottom at Rochester was not to be more than two inches below the bottom of the aqueduct, giving nine feet depth of water at Lockport and seven feet six inches at the west end of the aqueduct. Under this latter plan the canal was located, put under contract, and was under construction during 1854. Its success was shown by the fact that during an extremely dry season, when all the canals were in want of water, no trouble was experienced from Lockport to the Seneca river, without resorting to the water of the Genesee river.¹¹²

The difficulty caused by excessive use of water by the mills at Black Rock was expected to be overcome by the erection of a masonry division wall between the canal and the mills, as a part of the enlargement plan—the mills to obtain their water directly from the harbor.¹¹³

From Macedon west to Rochester, opinions had for years varied as to the most desirable route. Numerous surveys had been made. Till 1851 the canal board had decided to follow the old line across the Irondequoit valley. In that year, as previously noted, the board adopted the "Independent" line. New examinations and estimates were prepared in 1854. Engineer Van Vleck, in

¹¹²*Assembly Documents*, 1855, No. 50, State Engineer's Annual Report for 1854, pp. 169-171.

¹¹³*Id.* p. 172.

charge, said, in reporting, that the independent line was adopted in 1851 by a bare majority of the board, and that the limited amount of money available for these improvements and the increased expense of this line, by the sum of \$682,251, had caused the reconsideration of the project by subsequent boards, and its construction had been deferred. Another objection was that the law did not at this time permit the abandonment of the old line of the canal through cities and villages. The line now adopted by the board substantially followed near the old line, passing through Pittsford, but changing the lift of the locks, cutting off the heavy curves and saving nearly two miles in distance. The independent line would have saved 5.35 miles.¹¹⁴

The drainage of the Cayuga marshes continued in progress during the year. The contract at Mosquito Point bar was abandoned on November 1, but the excavations at Jack's reef were progressing vigorously, about half of the original appropriation of \$100,000, under chapter 178, Laws of 1853, having been expended.

Governor Myron H. Clark's message in 1855 said that the State tax had been raised during the previous year (1854) from one-quarter mill to one mill on the dollar, by the Legislature of 1853, but over half of the amount thus raised, \$657,145.86, was paid under the law, to contractors, for damages, etc., which largely increased the deficiency in the general fund. The entire canal receipts during the previous year were \$2,988,665.21, and the aggregate canal expenditures were \$1,237,865.20. The surplus was therefore but \$1,750,799.01. The constitutional requirements set apart \$1,944,861.72 for various purposes, including \$200,000 for State government. This created a deficiency in canal revenues of \$194,062.71, which was attributed by the Governor to commercial embarrassments, unusual droughts followed by short crops; to navigation impeded by want of water and restricted channels, and to the active rivalry of competing modes of transportation; also to a large increase in repair expenditures, partly due to inconsiderate legislation. If the canal revenues did not substantially increase, said the Governor, there would be no surplus revenues for enlargement. The first loan of \$2,225,000 under the new amendment realized a premium of \$342,952.77. The work under contract at this time (January, 1855) amounted to \$4,538,741.84, at an average of twenty-one per cent less than estimates.

¹¹⁴*Assembly Documents*, 1855, No. 50, pp. 167-168.

The canal auditor also said, upon the same subject, that it was much to be regretted that the revenues of the canals, for the past fiscal year, had not been equal to the charges on them, though meeting all requirements, except those of the general fund "with a revenue diminished by untoward causes," said he, "arising from the unexampled commercial embarrassments in the country. . . . With an imperfect navigation and an unfinished canal struggling under every disadvantage, against works and facilities furnished by private corporations and individual enterprise, adapted to and keeping pace with the wants and demands of trade and commerce, and burthened with an unusually large expenditure for collection, superintendence and ordinary repairs, the result is not surprising."¹¹⁵

While the expenditures under superintendents for repairs had unaccountably increased during the past few years, and while he thought it desirable that the experiment of letting out the completed sections under contract for repairs should be fully tested, the latter system was open to grave doubts of its ultimate success and expediency, for the reason that the contractor, governed by self-interest, would do as little as possible and as slightly as possible for the money. He feared that, while such a system might do for ordinary circumstances, a large break or other emergency might find them unprepared or inefficient. The auditor conceded the injurious effect of the carrying trade of the railroads upon canal revenues. They were enjoying extraordinary rights and privileges and under present financial conditions, until the completion of the canals, should be required to pay tolls upon their tonnage as a bonus for their privileges. There was no question of the right of the Legislature, under the Constitution, to reimpose tolls.¹¹⁶

The State Engineer and the canal commissioners did not, however, seem to share the fears of the auditor as to the disastrous effects of railroad competition, but were of the opinion that while light and costly articles would naturally seek more rapid transportation, the canal would be preferred for heavy and staple articles more than enough to make up its loss.¹¹⁷

¹¹⁵*Assembly Documents*, 1855, No. 5, pp. 8-9.

¹¹⁶*Id.* pp. 8, 9, 11 and 25.

¹¹⁷*State Engineer's Annual Report*, 1854, pp. 11 and 147.

The commissioners attributed the increased expenditures to the enhanced price of labor and materials; to at least one hundred thousand dollars disbursed in widening and straightening the narrow and crooked portions of the old canal; and to a bitter controversy which had arisen between the canal board and Commissioner Mather during the year over the discharge and appointment of certain repair superintendents, which resulted in a duplicate set of officials, a double payroll and a lavish waste of money on many sections.¹¹⁸

The State Engineer was of the opinion that there was but one remedy for the errors in management, and that remedy was not by contracting the repairs, or placing higher non-partisan officials in charge, but "by a sale of the canals, after completion, in whole or in part."¹¹⁹

Upon the advice of the Attorney-General, the concurrent resolution of the year before, instructing suit to be brought against the former canal auditor for advancing moneys "to certain alleged canal commissioners without authority of law," was repealed by another resolution. This was passed on April 12, 1885.

Judge Lincoln says that "agitation concerning canals did not cease with the adoption of the amendment of 1854. Amendments to the canal article were proposed in 1855, amending §§ 1, 2, 3, and 12 of article 7. Section 12 was to be amended so as to except debts included in §§ 2, 3, 10, and 11 from ratification by the people."¹²⁰

It was obvious that the Legislature, as well as the State officials, was not of one mind at this period, as to the best course to be pursued in the management of the canals. In the Senate, on April 10, the canal committee reported a bill to enable the authorities to enter into a contract with Charles Cook, a former canal commissioner, and Wm. J. McAlpine, a former State Engineer, to keep all the canals in repair for ten years, at \$700,000 per year, under a bond of \$250,000, but the measure failed to pass.

Chapter 23, Laws of 1855, authorized the second installment of \$2,250,000 of the constitutional loan, making \$4,500,000 in all, to enlarge the Erie, the Oswego and the Cayuga and Seneca

¹¹⁸*Canal Commissioners' Annual Report*, 1854, p. 146.

¹¹⁹*State Engineer's Annual Report*, 1854, p. 16.

¹²⁰*Constitutional History of New York*, Vol. II., p. 224.

canals, for completing the Black River and Genesee Valley canals, and to provide for the payment of certain canal revenue certificates. The commissioners' authority to borrow from time to time, to pay the appropriations, was by chapter 330, Laws of 1854. Less than a million dollars of this amount had been expended to the close of the fiscal year (September 30, 1854).

Chapter 554, extending the act of the previous year, provided that any completed superintendent's section might be let by contract for repairs.

By this time the condition of the State finances had become a matter of grave public concern. The revenues from tolls upon the canals were falling off, and it was doubtful if the gross receipts would pay the heavy fixed charges under the Constitution, as well as the rapidly increasing expenditures for maintenance and repairs, and leave any residue to apply on the enlargement. Although this condition and its causes had been the subject of more or less comment for some time, the situation now became so acute that Governor Clark, as a remedy, sent a special message¹²¹ to the Legislature on March 20, advising the reimposition of tolls upon all railroad tonnage diverted from the canals. The canal auditor also expressed similar views in his "Tonnage" report.¹²²

The Assembly committee of ways and means, to which the Governor's special message was referred, reported a bill on March 27, to reimpose tolls on railroads. Four thousand copies were ordered printed for distribution. In the bill the railways seem to have been grouped together according to the proportion of their traffic diverted from the canals. All were required to make traffic returns to the canal auditor of all property transported, except neat cattle, horses, sheep, swine, fresh meats, poultry, eggs, butter, cheese and the ordinary baggage of passengers.

The New York Central Railroad Company, the Canandaigua and Niagara Falls, the Oswego and Syracuse, the Rensselaer and Saratoga, the Saratoga and Schenectady, the Saratoga and Washington and the Rome and Black River Railroad Companies were to pay regular canal tolls on freight as if "transported the same number of miles on either of the canals of this State." The New York and Erie, the Buffalo and New York City, the Buffalo, Corn-

¹²¹ *Assembly Documents*, 1855, No. 97.

¹²² *Assembly Documents*, 1855, No. 95.

ing and New York, the Cayuga and Susquehanna, the Canandagua and Elmira, the Syracuse and Binghamton and the Watertown and Rome Railroad Companies were to pay two-thirds canal rates. The Northern Railroad Company was to pay one-half canal rates.¹²³

It may be imagined that the provisions of this measure created a flutter in legislative circles. The railroad companies obtained its reference again to committee and an opportunity to be heard. Thousands of printed forms were distributed and from the cities and towns along the lines of the railways came the remonstrances of officials, business men, shippers, bankers, capitalists, stockholders and other prominent men. The "business men of New York city" added their signatures, upon the plea that trade would be driven from that city. The manuscript petitions of half a century ago are yet preserved in the archives of the State library and an inspection of the lists shows that nearly every name was of some one financially interested in the result of the proposed legislation. This exhibition of the power of railways and of capital, even at that early period, is a striking one. What wonder, then, that the Governor's message failed of its purpose and that the bill did not again emerge from the committee room. In the Senate the committee was divided and presented an adverse report.¹²⁴

It may be noted that during the season of 1855 a contract was made to test Samuel J. Seeley's improved apparatus for operating lock-gates at the Albany weigh-lock. This was by means of a wire cable or chain passing around a sprocket wheel, which was secured to a capstan on either side. This was attached to the gates, so that power applied to the capstan opened both gates. Balance beams were dispensed with and the gates otherwise supported, obviating the necessity of detaching the tow-line. Tests showed that one man could open and close both gates in 35 seconds. Formerly it took five men 56 seconds. One man opened both gates in 12 to 15 seconds. Formerly it took four men 21 to 25 seconds. A six-year-old child, weighing 40 pounds, opened both gates. The improvement was adapted to lift as well as weigh-locks and was a saving of time and money.¹²⁵

¹²³*Assembly Documents*, 1855, No. 107.

¹²⁴*Senate Documents*, 1855, No. 74.

¹²⁵*Canal Commissioners' Annual Report for 1855*, pp. 141-143.

Engineer George Geddes reported that operations were progressing to reclaim 30,000 acres of Cayuga marsh land. Of the \$100,000 appropriation, \$69,102.38 had been expended, \$60,000 more would be required.¹²⁶

It appears that differing views were held at the time as to the relative authority of the canal board and the individual commissioners, who were members of that board. In December, 1855, the board called upon Commissioner Gardinier for certain information. The commissioner did not recognize the authority of the board to sit in judgment on his official acts, and not desiring to establish a precedent, he did not deem himself called upon to comply with the request. The Assembly, by resolution, requested the information to be furnished "within ten days." It was furnished by the commissioner to the canal board within the specified time, and the "precedent" was established.¹²⁷

The Governor's annual message for 1856, reviewing the events of 1855, says in substance: The gross canal receipts for the past fiscal year were \$2,639,792.12; expenses of collection, superintendence and repairs were \$989,792.12, leaving \$1,650,000,—sufficient to meet constitutional requirements for canal debt sinking fund (\$1,300,000) and general fund debt sinking fund (\$350,000), but not sufficient for constitutional requirements for interest on loans for enlargement or for appropriations towards a sinking fund for the principal of such debts. Provision for these latter had been made by direct tax. The Governor attributed the embarrassment in finances not to the inability of the canals to pay for their improvements, but to the short time allowed by the constitutional limit of eighteen years, in which to do so. He advised an amendment extending the period, enabling the payment of the State debt from canal revenues and avoiding or reducing direct taxation. The six per cent loan of \$2,250,000 for enlargement, issued during 1855, brought a premium of \$365,880.05. In June, 1855, a revenue-certificate redemption-loan, to cover the issue in 1851 of \$1,500,000, brought a further premium of \$259,405. The facility with which these and other loans were made, said the Governor, some at only five per cent, and the large premiums received, showed not only that the credit of the State was unimpaired but

¹²⁶*Canal Commissioners' Annual Report for 1855, p. 94.*

¹²⁷*Assembly Documents, 1856, No. 87.*

that the prospect of the early completion of the canals had greatly strengthened it.¹²⁸

The perennial claims of the Rochester mill owners were again brought to notice by the report of the canal appraisers to the canal board, submitting the awards and testimony under chapter 462, Laws of 1855. The claims extended from 1832 to 1853, inclusive, and amounted to nearly a quarter of a million dollars. After an exhaustive and interesting historical review of the Genesee feeder, the appraisers held that the appropriation of the waters of the Genesee river from the time of the construction of the Erie canal *was permanent*, and so intended. The State was simply using its own property, the losses since 1832 having been but the legitimate consequences of the rightful and permanent appropriation of 1822. The rejection of such claims followed. As to the permanent injury resulting from the construction of the Genesee Valley canal, claimants on the Seymour and Johnson race were awarded \$13,500, and on the Brown race \$10,125, as damages.

Chapter 327, Laws of 1854, authorizing a trial of the system of repairs by contract upon not to exceed three superintendent's sections of the enlarged Erie canal, had been extended by chapter 554, Laws of 1855. When the original law was enacted, there were but two such sections completed. One of them, No. 8, extending from the Limestone creek feeder in Manlius to the foot of lock No. 50, four miles west of Syracuse, a distance of eleven miles, was put under contract for a term of years from the first of October, 1854; the other, section No. 1, at Albany, was put under contract for a similar term from the first of March, 1855. Under the amended act of 1855, the Chenango, Crooked Lake and Oneida Lake canals, and the Chemung canal and feeder, all on the middle division, were put under contract in September for five years from October 1; the Genesee Valley in December for the same period from February 1, 1856; and the Black River and Champlain canals for the same period. Under the contracts let prior to December previous, the repairs had been made as promptly and as well as under the old system, and the navigation satisfactorily maintained at a greatly diminished expenditure, and the commissioners had every reason to believe that the con-

¹²⁸ *Assembly Documents*, 1856, No. 3, pp. 2-5.

tract system, if fully adopted, would rescue the canals from the extravagance and corruption which, if not arrested, threatened to swallow up the entire revenues.¹²⁹

The commissioners of the middle and western divisions approved the suggested plan of abolishing the office of repair superintendent and placing the control with the resident engineers. The Senate canal committee of 1856, having in charge a measure for this purpose, namely, "An Act prescribing regulations for the repairs and superintendence of the canals," heartily indorsed the views of the commissioners.¹³⁰ An Assembly bill was also favorably reported, the committee saying that the interests of the State and economy would be promoted by such a change.¹³¹ The Senate requested the canal board to inform them "what, in their judgment, would be the effect of the entire and summary abolition of the canal superintendents . . . as to the saving of expenses, the condition and care of the public property, and the general interests of the canals, in the event of the dismissal of that class of officers." This gave the board an opportunity, which they did not neglect. The majority compared the expense of supervision under existing provisions with that by engineers, to the detriment of the latter method, and reported in strong opposition to disturbing the existing system.¹³² The minority report¹³³ of the canal board advocated the passage of the bill, strenuously dissenting from what they termed the "specious and fallacious" arguments of the majority. The Assembly canal committee also advocated its passage, estimating an annual saving thereby of nearly \$450,000. But the bill did not pass.

State Engineer Silas Seymour, in his annual report for 1855, said that experience had shown that it was impossible to separate the management of the canals from the deleterious influences of party politics, resulting in wasteful extravagance, and he therefore reiterated his statement of the previous year, that the sale of the public works, in whole or in part, was the only effectual remedy and must eventually take place. He approved the plan of abolishing the office of repair superintendents, or at least of placing them in control of the commissioners, instead

¹²⁹*Canal Commissioners' Annual Report* for 1855, pp. 163-164. .

¹³⁰*Senate Documents*, 1856, No. 31.

¹³¹*Assembly Documents*, 1856, No. 31.

¹³²*Senate Documents*, 1856, No. 42.

¹³³*Senate Documents*, 1856, No. 43.

of the canal board. He said that 564 separate contracts were then in process of execution, extending over about six hundred miles of canal, and entailing a large amount of engineering services. He called attention to the wall benches as constructed upon eighty-five miles of the Erie canal prior to 1848, and said that it would become necessary, at some future period, to remove the bench or hip which formed a projection in the prism, and to make its size and form to correspond with the plans adopted in 1848, and sanctioned by the canal board. In his own estimates submitted, he had made no provision for the change referred to.¹⁸⁴ This is here noted as seemingly the first official reference to what, a decade later, proved to be one of the most persistent causes of complaint in canal management and expenditures.

The Assembly ways and means committee, on March 28, 1856, presented a report upon the financial condition as related to the canal improvements,—the policy of indebtedness and the now obvious conclusion, that the sum authorized for its completion by the amendment of 1854 would fall several millions short of being sufficient to accomplish the results expected. Their criticism fell severely upon the fallacious estimates based upon anticipated revenues from the canals, which were subject to so many unreliable contingencies; they condemned the clause which provided that the work should be so progressed as to bring the entire line into use at once, saying:

"The moneys authorized by the amended constitution to be raised to complete our public works will fall short of accomplishing that result. The act under which the appropriations are made was so framed as to leave every work unfinished when the nine millions shall have been expended. This was intentional on the part of those who arranged the details of that act, so that when further loans became necessary, an interest might be combined in their favor, powerful enough to rule the State, and to secure enactments for that end. The committee will not stop here to inquire into the character of the deception practiced upon the people at the time the "Nine-million" loans were proposed, nor to characterize the policy under which it is to be expended, leaving no work completed. It is sufficient to know, that further means will be required to bring into use the canals, upon which

¹⁸⁴ *Assembly Documents*, 1856, No. 180, pp. 21, 22, 23 and 35.

so much money has already been expended, and that the question must soon be met in some practical way.

"Of all the measures proposed to raise money by loans, no one presents the fair, honorable features of that which plainly lays before the people the amount needed, asking them to authorize the loan, and the means of paying the interest and principal when due. Were we called upon, at our present session, to devise the ways and means of meeting this deficiency, we should recommend this course, as in every respect the most safe and satisfactory.

"The provisions of the constitution were intended to meet the necessities of just such a contingency, and it is far better to preserve these provisions intact, than to resort to a periodical amendment of that instrument."¹³⁵

In accordance with the provisions of the act of 1854, as stated by the canal commissioners, by which the several contracts for enlargement were to be so timed as to be brought into use at the same time, the entire work had been let to be completed in 1858. "By the amendment to the Constitution of 1854," said the commissioners, "only two and a quarter millions of dollars per annum could be applied of the nine millions authorized to be borrowed for the completion of the canals. These appropriations of two and a quarter millions each, had been made by previous Legislatures, for the three fiscal years ending Sept. 30, 1856, amounting in all to six and three quarter millions of dollars, and leaving two and a quarter millions to be appropriated by the present Legislature for the fiscal year commencing Oct. 1st, 1856. This leaves as the only available funds applicable to the canals after the 1st of October, 1857, the premiums already and hereafter to be realized from the loans of the above nine millions, which are estimated as nearly as may be to amount to \$1,595,854.32. The cost of the completion of all the canals from the 1st of Jan., 1854, including engineering expenses, and land damages, As estimated by the State Engineer at \$13,131,808 74 From this amount deduct the \$9,000,000 00 And the estimated premiums and

interest	1,595,854 32	
	<hr/>	10,595,854 32
Showing a deficiency of		\$2,536,074 42

¹³⁵ *Assembly Documents*, 1856, No. 181, p. 27.

in the amount necessary for the completion of the canals. This amount must be supplied in such manner as the present or succeeding Legislature may direct."¹³⁶ In making this statement to the Assembly of 1856, the canal commissioners advocated an extension of the time limit on loans, to enable the canal revenues to meet the charges.

In view of the increased estimates submitted, the Assembly endeavored, by department inquiries, to obtain an accurate statement of the actual situation of the work of enlargement on the several canals of the state, giving the statement of the Erie in divisions, and showing how nearly the entire work had been put under contract, when such contracts were to expire, what would be the probable deficit (after expending the nine millions provided by law), required for their completion, and whether or not a new basis of apportionment would be necessary to assure their synchronous completion. The canal board replied that the entire work was under contract, excepting sundry items aggregating less than \$200,000. The progress of the work, they said, was governed by the appropriations to each purpose rather than by the time limit of the contracts. It was then contemplated to bring the enlargement of the Erie canal into use from Albany to Montezuma by May 1, 1857, while the lateral canals and the western division of the Erie could not be completed until two years later. The deficit was estimated at \$2,519,226.65. This was the opinion of five of the nine members of the board. The minority, including Lieutenant-Governor H. J. Raymond, State Engineer Silas Seymour and Commissioners Gardinier and Fitzhugh were of the opinion that a different basis of apportionment was necessary, so as to bring forward the western division and the Oswego and lateral canals, in order to permit the passage of boats of equal size, tonnage and draught with the eastern division.¹³⁷

Among the most important structures of the Erie canal was the "Richmond" or Montezuma aqueduct, spanning the Seneca river, and known at that time by the name of its designer, Van R. Richmond. This was brought into use in the spring of 1856. It had a wooden trunk with a clear width of fifty feet at water-surface, which was carried upon thirty piers and two abutments

¹³⁶*Assembly Documents*, 1856, No. 100, pp. 173-174.

¹³⁷*Assembly Documents*, 1856, No. 191.

of hydraulic stone masonry. The thirty-one openings or waterways for the river were each twenty-two feet wide and eleven feet high. The foundation floor covered an area of 79,783 square feet, or nearly two acres, supported on 4,464 bearing piles, varying in length from fifteen to thirty feet. The towing-path, with a parapet wall three and one-half feet high, was carried over on thirty-one stone arches. During construction a wooden lock temporarily connected the navigation of the old canal with the aqueduct level. On completion this level was extended to the Clyde lock.¹³⁸

Although the unexpected balances of the appropriations for the enlargement were \$1,561,086.53 on September 30, 1855, that sum, with the annual appropriation of \$2,250,000, was exhausted before October 1, 1856, by commissioners' drafts in favor of contractors, engineers, and for land damages and payments for other objects chargeable to these appropriations, and it became necessary, according to the commissioners' representations, to anticipate the appropriations for the next fiscal year, in order to preserve navigation and complete some works necessary to be brought into use on the lateral canals. Under these circumstances of imperative necessity, commissioners' drafts to the amount of \$123,527.88 were paid by the auditor and refunded out of the appropriation under chapter 148, Laws of 1856.

In the State Engineer's report for 1856, it appears that in October notice was given to various contractors that current appropriations were exhausted, and thereafter work was generally confined to bringing the largest amount of enlarged canal into practical use before the entire means provided (under the amendment) for this purpose should have been expended.

The operations at Jack's reef for draining the Cayuga marshes were continued throughout 1856, with the result of lowering the water at Cross lake two and one-half feet, with a probability of four and one-half feet on completion. The supply bill for 1857 appropriated \$25,000, and it was estimated that \$55,000 more would be required for completion. \$130,239.56 was expended to January 1, 1857, including \$36,516.83, as extra allowance, granted to the contractor by the Legislature of 1856 for difficult excavation and "under-water work."¹³⁹

¹³⁸*State Engineer's Annual Report for 1855*, pp. 22, 23 and 108.

¹³⁹*Canal Commissioners' Annual Report, 1856*, pp. 111-112.

In reviewing the situation at the close of 1856, Governor John A. King, in his annual message to the Legislature of 1857, said that in 1855 the repair expenses were \$887,934.46, and in 1856, when more finished sections had been put under contract, they were \$669,405.16, making a reduction of \$568,460.04 from the amount spent in 1854 for the same purpose. In calling attention to the deficiency that would exist after the loans authorized in 1854 had been exhausted, he said that the work had generally been contracted for below the estimates and on terms favorable to the State, and that this deficiency arose because the estimate for the amendment of 1854 had not included expenses for engineering, land and other damages. However much this condition might be regretted, this deficiency was to be met, the interest at stake being too important to allow of suspense.

However, the Governor took an optimistic view of the situation, saying that there were 892 miles of canals, which would cost, completed, \$50,000,000. The deficiency then existing was only about one-twentieth of their cost and could be well borne by a State in its manhood, with an assessment roll of fourteen hundred million dollars. No thought of hesitancy in completing the canals, much less any purpose of selling them, should be entertained for a moment.

Comptroller Burrows also advocated a direct tax, as suggested by Governor King. To State Engineer Clark's estimate of a deficiency of \$2,535,974, he would add, for safety, enough to make a round \$3,000,000, and he said that a three-quarter-mill canal tax for three years to come would raise a million annually and would be more quickly available than the method by a constitutional amendment.¹⁴⁰

In his annual report¹⁴¹ for 1856, submitted January 15, 1857, the State Engineer said: "The following estimate is now submitted to the Legislature as the most reliable one that can be formed of the total cost (from and after the 31st December, 1853) of the 'enlargement of the Erie, the Oswego, the Cayuga and Seneca canals, and the completion of the Black River and Genesee Valley canals, and the enlargement of the locks on the Champlain canal,' as provided for in the amendment to the

¹⁴⁰*Comptroller's Annual Report for 1856*, pp. 54-55.

¹⁴¹*Assembly Documents*, 1857, No. 60, pp. 14, 16, 17 and 21.

Constitution adopted on the 14th day of February, 1854." Condensed, the estimates cover, for work done in 1854, 1855 and 1856, including land damages and engineering, \$9,174,909.80; and to complete the work, \$5,075,090.20; in the aggregate, \$14,250,000. This assumed that the extra \$1,500,000, raised in 1854, provided payment for all work done prior to that time and under the revenue certificates of 1851. The State Engineer said that when the amendment of 1854 was adopted it was supposed that the surplus canal revenues, together with the loan of nine millions then authorized, including premiums and interest on premiums, would provide for the cost of the improvements. It was now patent that no reliance could be placed upon the surplus revenues for this purpose. Deducting the proceeds of the loan—amounting to, say, \$10,500,000—there remained a deficiency of \$3,750,000.

The question of the hour, to him, appeared to be: "How can the surplus revenues of the canals be used as a basis to secure their completion within the shortest practicable time?"¹⁴² To save the delay which another amendment would cause, he advocated borrowing from the people a sufficient amount to avoid suspension of the work, and at the same time proposing an amendment providing means for the repayment of the loan and for the completion of the work. This would mean taxation in combination with a constitutional amendment and an extension of the loans, so that the canal revenues would ultimately take care of the debt.

As to the management of the canals, he blamed the interference of partisan politics through the medium of a canal board of nine members, of which only the engineer and the three commissioners were assumed to have practical knowledge of canal affairs and were respectively held responsible in their departments for its success. Yet the board, and not the State Engineer, appointed the engineers in charge of work; the board, and not the commissioners, appointed the superintendents of repairs; these appointments possibly depending on the political complexion of the canal board.

He advocated a modification of the law requiring the letting of contracts "to the lowest bidder," in the interests of good management, as Mr. Clark, his predecessor, had done before him.

¹⁴²*Assembly Documents*, 1857, No. 60, p. 16.

Commissioner Fitzhugh, of the middle division, expressed his continued confidence that the system of repair contracts, while not perfect, was yet a great improvement on the old system. As to appointments, he said the canal commissioners were held responsible by the public for the condition of the canals under their charge, while the agents appointed to carry out the details of superintendence and repairs were often not only appointed without their consent, but against their remonstrances.

"The appointment of engineers by the Canal Board," he said, "without reference to the wishes of the State Engineer, or his opinion of their capacity to discharge the duties to which they must be assigned by him—often of persons of whose qualifications he is entirely ignorant—the conflict between the Canal Board and the State Engineer as to the right of one or the other to locate engineers, and the frequent changes that have been made in their appointment, has resulted in a state of instability, confusion, insubordination and inefficiency in that department, highly prejudicial to the public interests, and which demands prompt correction at the hands of the Legislature."¹⁴³

The canal auditor, N. S. Benton, in his report for 1856, made a careful analysis of the increase and decrease of various classes of canal freights. He said: "The ascertained results presented are . . . worthy of much reflection. They not only show the steady and progressive *increased* carriage and movement, by railway, and the steady and progressive *decreased* carriage and movement by canal, but they also show the description of freight wherein the carriage by rail exceeds that of the canal." He compared the tonnage and the tolls received since 1851, and said: "The average [tolls] of 1851, on the tonnage of 1856, would give \$3,542,178 of tolls" (a million more than the actual receipts). He was satisfied that the rates of toll, as arranged in 1851, might be imposed on most of the property transported on the canals, without any injury to trade, if the Legislature would interpose its constitutional authority to protect the trade of the canals; and he ventured the prediction then, that the cheapening of transportation by the canal would not enable the State to realize a revenue commensurate to the constitutional demands upon the canal tolls, without the specific legislation referred to

¹⁴³ *Assembly Documents*, 1857, No. 145, p. 201.

in his report to the commissioners of the canal fund, namely, the reimposition of canals tolls upon competing railroads.¹⁴⁴ The canal board was at this time advocating to the Legislature a further reduction of tolls on certain articles.

In his annual report to the commissioners of the canal fund for the same year, the auditor said: "In order to meet all these constitutional appropriations and requirements, the surplus annual revenues of the canals must amount to \$3,277,389.07."¹⁴⁵ They had not, as he stated, amounted to this sum in any year either before or since 1846, and would not for years to come, unless measures were taken to increase the net receipts by reducing expenses and protecting the State from fraudulent practices and devices. The charges for extraordinary repairs were entirely within the control of the canal board. The administration of the system might be vicious, while the system itself might be faultless. The auditor deprecated any reduction in the rate of tolls. In this connection it is of historical interest to note his statement that, "when the railroads from Albany to Buffalo were chartered, it was supposed the State would lose all the tolls on packet boats and passengers, as soon as the lines were completed and opened for traffic. In 1836, these tolls amounted to nearly \$100,000; in 1840, to \$36,815; in 1855, to \$1,228; and in 1856, they touched zero. It was not until after 1850, however, that the railroads succeeded in taking all or nearly all the emigrant passengers from the canals."¹⁴⁶

In this same document is contained an extremely interesting, though futile, argument upon the constitutionality of the act of 1851, abolishing tolls upon railroads. The auditor said that when the Constitution was adopted in 1846, some of the railroads were entirely prohibited by their charters from carrying freight under any conditions, while others could do so only upon payment of tolls. By chapter 270, Laws of 1847, all the railroads were allowed to take freight, but only upon the payment of tolls, which tolls were to go to the canal fund. This was not considered as a violation of the sixth section of article seven, because it did not alienate any part of the canal income. As the

¹⁴⁴*Assembly Documents*, 1857, No. 185, pp. 6 and 9.

¹⁴⁵*Senate Documents*, 1857, No. 10, p. 13.

¹⁴⁶*Id.* p. 37.

Legislature could not "sell, lease or otherwise dispose of any of the canals," it followed that their revenues, "known, fixed and enjoyed when the Constitution was adopted," could not be alienated, but must "remain the property of the State and under its management." "The State held an ungranted franchise in 1846," said the auditor, "which seemed to its citizens a sure and certain immunity from all future burthens in regard to a class of specified claims. Should or can that franchise be alienated before all the beneficial objects for which it was held, had been satisfied."¹⁴⁷ If the State could grant away any portion of its revenues, he argued, it could dispose of them all without reserve. The act to abolish tolls on railroads was passed as a majority bill on July 10, 1851. In the printed session laws it does not appear that a three-fifths quorum was present, or that it was passed by a two-thirds vote.

"Did not the act of 1851," he continued, "release, discharge or commute some claim or demand of the State? If so, then it can have no constitutional efficacy, unless it was voted for by a majority of all the members elected to each house, when a three-fifth quorum was present.

"Did the act appropriate public moneys or property for local or private purposes? If it did, then it could have no constitutional validity, except with the assent of two-thirds of the members elected to each branch of the Legislature.

"If the Legislature cannot sell, lease, or otherwise dispose of any of the canals of the State, can it sell, lease, or in any manner alienate or dispose of the profits, income, or tolls of the same?

"Can the Legislature, by direct action of any kind, so reduce the canal tolls as to render the surplus insufficient to meet the trusts constitutionally charged upon them? or in other words, would a law be valid which fixed the tolls at so low a rate, as to produce only income, sufficient to pay the 'expenses of collection, superintendence and ordinary repairs,' and leave the trust funds to be provided for in some other way?"¹⁴⁸

To the argument that the reclamation of the railroad tolls would be an exertion of power, hurtful to trade and commerce, and be open to the charge of establishing a monopoly in the trans-

¹⁴⁷*Senate Documents*, 1857, No. 10, p. 40.

¹⁴⁸*Id.* pp. 41-42.

portation of merchandise to market, it was answered that, if it was only a question of the reimposition of tolls or of repealing the law of 1847, there might be some grounds for its consideration, but such was not now the case. It had become a question of whether "the State, to redeem its obligations, [would] resort to the capacity and income of the canals to enable it to maintain its high and commanding position; or [would] it cripple the capacity of its public works, by surrendering to corporations, which are but the mere creatures of its will, the power to take so much of the carrying trade as may suit their pleasure or purpose, and thereby from loss of revenue, be compelled to turn round and levy a tax upon the people to replenish an exhausted treasury, and enable it to perform its whole duty to the public creditors."¹⁴⁹

"It is difficult," said the auditor, "to see the justice or the right, or even the expediency of our loading posterity with a debt of our own creation, when the heritage we give them therefor is a poor, old worn out and dilapidated canal, whose income from year to year we have handed over to the pockets of private individuals instead of applying it to the payment of this inheritable public debt."¹⁵⁰

There was no doubt, in his mind, but that the canals would be able to maintain themselves and eventually to pay their indebtedness, if they could have the benefits of the carrying trade for which they were built. If it were true that shippers would pay fifty per cent more for transit by rail, it should not be forgotten that the State had called these railways into existence, not alone by the exercise of its sovereign power in granting their franchises, but by a direct loan, and later a grant, of some three millions in one case and six hundred thousand-dollar loans in several others, without which they would not have been completed when they were. If these considerations were not sufficient, the State could further say "that the completion of the Erie canal in 1826, opened the facilities for planting an empire at the west which now compared favorably in population and production with the old thirteen States in 1774, and that the development of production and trade consequent upon the con-

¹⁴⁹*Senate Documents*, 1857, No. 10, p. 42.

¹⁵⁰*Id.* p. 43.

struction of the canals, now [brought] to the railways a traffic, the annual receipts from which far [exceeded] the original cost of the Erie canal." If it appeared that "by railway diversion and competition, the trade and traffic on the canals [was] seriously impaired, and the revenues so diminished and diverted as not to be sufficient to satisfy the annual charges upon them, such an exigency must fully justify the act of reclamation." It was "a financial fallacy to say these tolls [were] not wanted to pay the interest on the new debt of \$11,000,000, while the present deficiency [continued]. This process of borrowing money to pay the annual interest, [would] increase that debt about \$11,000,000 more by . . . 1872, if the bottom of the loan bag [should] not be sooner reached."¹⁵¹

The legislative journals of the year 1851 show that the bill "to abolish tolls on railroads" passed the Senate on July 9, by a final vote of 22 for and 5 against,¹⁵² and the Assembly on July 10, by a final vote of 81 for and 16 against.¹⁵³

The net results of the legislation of 1857 were: the passage of chapter 363, as we have stated, providing for a general tax of one mill on the dollar for canal purposes and for a \$500,000 loan; chapter 364, appropriating from the revenues for the fiscal year beginning October 1, for maintenance and ordinary repairs and collection, \$850,000, for interest and principal of the canal debt of 1846, \$1,700,000, for the general fund debt sinking fund \$350,000, for sinking fund for loans under section three of article seven, \$410,000, and for State expenditures \$200,000, these being all "constitutional items;" chapter 365, for the enlargement and completion of the canals, appropriating \$3,250,000 from the balance of premiums on loans and the proceeds of the mill tax above provided for, including the half million loan; appropriating \$29,569.08 to pay the awards of the canal appraisers on the Genesee river claims, and confirming the awards; and a concurrent resolution on March 2, forbidding contractors from letting or leasing surplus canal waters under their charge, under penalty of forfeiture of contract.

"In 1857, another amendment was proposed to § 3 of article 7, authorizing the legislature to borrow \$4,000,000 to complete the

¹⁵¹*Senate Documents*, 1857, No. 10, pp. 44-45.

¹⁵²*Senate Journal*, 1851, p. 909.

¹⁵³*Assembly Journal*, 1851, p. 1657.

canal improvements."¹⁸⁴ So reads the *Constitutional History of New York*. Such a joint resolution appears to have been introduced in Assembly on February 20, but we are unable to find that the Senate took any action thereon, to make it "joint."

The appropriations for enlargement and completion were again exhausted by June of 1857, and the auditor faced the alternative of causing the work to be stopped, or of borrowing from other funds. The latter course seems to have been taken.

During the year the Erie, the Oswego and the Cayuga and Seneca canals were navigated by boats drawing four feet of water and carrying 130 to 150 tons. Prior to bringing the completed line of enlarged locks into use in 1854 and 1855, the burden of boats was from 90 to 100 tons. Navigation was greatly interrupted and embarrassed during 1857, more than in any previous year. The severe winter and spring retarded work. No boats passed between Buffalo and Lockport prior to June 1, and numerous breaches subsequently obstructed traffic between Lockport and Clyde.

On November 19 a heavy snow storm and severe cold weather closed the Erie west of Rochester, cutting off Buffalo east-bound shipments at a critical period of the season. On the middle division three breaches at the Centerport aqueduct suspended navigation eight days in May, and another near Durhamville, two days in June. On the eastern division navigation was suspended for ten days in all. These were caused by excessive floods and by admitting water upon green and unsettled work. A large amount of tonnage was diverted to the railroads, and with the general depression of business throughout the country, this resulted in diminishing tolls to the extent of \$702,562 below the previous year.

The heavy floods demonstrated the value of the work of draining the Cayuga marshes. The cut at Jack's reef was completed, at a total cost of \$150,409.54, and the area benefited was covered by several less feet of water than ever before.

The amount estimated for work done, engineering, land damages, etc., upon the enlargement and other works authorized by the Constitution, during 1854, 1855 and 1856, as has been stated,

¹⁸⁴*Constitutional History of New York*, Vol. II., p. 224.

was \$9,174,909.80. The estimates for 1857, in addition, were \$2,862,923.07, making \$12,037,832.87 in all.

Governor King's message to the Legislature of 1858, in a spirit of fairness towards the railroads, recommended "as an equivalent for re-establishing the tolls on freight, that railroad companies paying such tolls, be permitted to make such equitable increase in their present charges for the transportation of passengers as the Legislature [might] authorize." Evidently the sentiment in favor of reimposing tolls was yet strong and the Governor's view was hopeful that such would be the result. "Of the canals," said he, "I must speak at some length and with entire frankness, not concealing whatever there may be of disappointment and discouragement in the statement to be made, but as certainly not doubting nor desponding, either as to the ability, the obligation, or the expediency of persistent efforts and sacrifices, if need be, speedily to complete the enlargement."¹⁵⁵ He referred to the fact that the net tolls for the preceding fiscal year had fallen short by \$110,984.40 of the \$1,700,000 required for the canal debt sinking fund, and also the \$350,000 for the general fund debt, or in all, \$461,984. The work of enlargement, he said, had been advantageously and steadily prosecuted during the past year. Assuming the Engineer's estimates of \$14,250,000 for completing the enlargement to be correct, and giving all proper credits, a deficiency of \$2,500,000 still remained, to meet which there was only the half million loan, authorized the previous year but not yet negotiated. He suggested, in addition to restoration of tolls on competing railroads, that canal tolls be raised to the limit of expediency, and that the balance be raised by a direct half-mill tax, equitably spread over the next two years, thus allowing the completion of the great work by the beginning of 1860, with an income which should thereafter obviate the necessity of taxing the people.

The annual report of the canal commissioners to the same Legislature, after a tabulated comparison of the expense of contract repairs with the former system, said: "The foregoing statements show clearly the greater economy of the system of letting the repairs of the canals by contract, compared with the old plan,

¹⁵⁵ *Assembly Documents*, 1858, No. 2, p. 6.

still in operation on more than half of the superintendent's sections, of hiring men to do the work by the day or month, under the discretion of the superintendents; and convinces the canal commissioners of the eastern and middle divisions, that the repairs of all the completed sections of the canals, should be placed under contract as early as practicable."¹⁵⁶ As to the completion of the canals, the commissioners said that the report of the State Engineer gave the amount required to complete, after January 1, 1858, as \$3,711,167.13. Sound public policy and a wise economy demanded that these sums should be appropriated to the several canals, so that their completion might be effected by the spring of 1859. To suspend the work, even for a short period, would involve a loss in materials collected and tools and machinery on the line, and claims of contractors for damages incurred by suspension, nearly, if not quite equal to the amount required to bring the canals into full use.

Opposing the argument then frequently advanced—to sell the canals and clear the State from debt, in view of diminishing revenues and the necessity for further taxation—the commissioners said that if such sale should be made, no matter who might be the purchaser, the inevitable laws of trade would soon bring the canals into the hands of the railways, rates would be raised to the limit of their power of enforcement and the regulative benefits of the canals would be forever lost. Since 1850 tolls had been frequently reduced “to meet the competition of railroads,” as they frankly admitted. If the tolls of 1846 had been retained upon the tonnage of 1856, the revenues would have been nearly five million dollars, and had the railways added their quota of tolls to the State treasury, the aggregate sum of seven and a half millions would have been in hand. In freights alone these figures gave some idea of the value of the traffic, said the commissioners. It is to be noted that they likewise gave some idea of the disastrous effects of railway competition for the traffic of the canals. They admitted that but for this competition even a higher rate than the tolls of 1846 might be maintained at this time without complaints; but for the regulative effect of the State canals, the additional

¹⁵⁶*Assembly Documents*, 1858, No. 20, p. 9.

cost to the people of the State of marketing their own domestic products would annually exceed the amount required to complete the canals.

Could it be doubted, the commissioners argued, that if both were under single corporate control, rates during the entire year would be advanced. The tariffs of the great lines even then were regulated by "conventions," and limited by their power to injure or annoy each others business. "Consolidation in some form or other," said they, "will exist sooner or later, between roads in competition for any given trade." This deliberate admission, made half a century ago by men whose business it was to be of broad knowledge and conversant with trade and transportation conditions, has been so absolutely fulfilled in these latter days of combinations and of trusts, that it seems prophetic in its accuracy. Give to a single corporation the power to control and manage both, continued the commissioners, and "it would make its own laws. It is notorious that railroad influences have controlled the legislation of this State, when they pleased to do so, at any time since the consolidation of 1853; and that the law for resuming the enlargement and completion of the canals in 1851, could not have been passed without the passage of an act also for releasing the railroads from canal tolls."¹⁵⁷

This means, if anything, that even at that early day the State, with all its power of the prestige of the canals and with public opinion behind it, was helpless to complete its canal improvements without the consent of the railroad interests, then comparatively infant in their proportions; and the price of that consent was the State's relinquishment, present and prospective, of its right to control the traffic which its canals had built up and made possible, by its people and for its people, and of its ability to build and maintain its hospitals, asylums, schools, roads and public improvements, to maintain the expenses of its State government and to pay its onerous indebtedness without the direct taxation of its people therefor. Is it then strange that, as elsewhere quoted, it was later said that every dollar of subsequent taxation and of indebtedness should be called "not a canal but a railroad debt"? The old, old question is as

¹⁵⁷ *Assembly Documents*, 1858, No. 20, p. 17.

pertinent today as then—"Upon what meat doth this our Cæsar feed, that he is grown so great?"

In reply to an Assembly resolution of March 16, inquiring as to the amount necessary to complete the canals and also as to the amount of work done for which no provision for payment had been made, the State Engineer answered that his estimates, based on the reports of his assistants in January preceding, called for \$4,955,777.14.¹⁵⁸ To his estimate of cost, including the year 1857, which we have given at \$12,037,832.87, there should now be added his estimates for costs after that date—\$3,712,167.13—making a total of \$15,750,000, as given in his annual report to the Legislature of 1858. An increase of \$1,500,000 will be noticed over the estimates of the previous year. The causes of this, he alleged, were: the more expensive character of the work as developed; an additional number and increased cost of structures, with substitution of vertical for slope wall, authorized by "special acts of the Legislature, and resolutions of the Canal Board;" and various other changes and additions, most of which were required by the transition from the old to the new canal.¹⁵⁹

The State Engineer again called attention to the probable necessity of bottoming out and of removing the wall benches from about 85 miles of the enlargement, as we have previously noted, at a probable expense of about a million dollars. These were caused by a change of plan in 1848, which, as State Engineer Clark had said in 1855, added to its cost, but greatly improved its capacity and usefulness, besides reducing the cost of maintenance. The change, he estimated, would add nine per cent to the capacity of the canal and would facilitate the movement of loaded boats.

In the Senate, on March 24, the State Engineer was requested to report the earliest day at which six feet of water could be secured through the entire length of the Erie canal. His reply¹⁶⁰ stated that all the necessary work could be done and the canal opened on May 1, 1859. As a precaution, however, against breaches, in opening a large amount of new work during

¹⁵⁸*Assembly Documents*, 1858, No. 116.

¹⁵⁹*State Engineer's Annual Report*. 1857, p. 18.

¹⁶⁰*Senate Documents*, 1858, No. 117.

the spring of 1858, it was advised that the opening he made with only the ordinary depth of water, to be afterwards deepened to six feet, as this might be done with safety. Two things are evident from this resolution and report—that the Senate was impatient at the procrastination, and that there was a marked discrepancy between the “ordinary depth” referred to above and the seven feet of water required by the plans for the enlargement.

In April of this year still further reductions of the toll-sheet were made by the canal board, including rates on wheat and flour, in order, as they said, to retain and increase canal shipments of those articles.¹⁶¹

The net results of importance in legislation of 1858 appear to have been the following: chapter 263, authorizing the auditor to pay interest on canal commissioners' drafts in certain cases; chapter 353, which provided for a half-mill general tax to replenish the canal fund from which to pay interest on the canal debt under section three, article seven of the Constitution, as amended in 1853;* chapter 329, transferring \$1,686,734.49 of unexpended Erie enlargement balances to the completion of sundry laterals; chapter 210, providing, from canal revenues, for maintenance, \$900,000, for deficiency in 1856, \$70,453.46, for the constitutional payment of interest and principal of the canal debt of 1846, \$1,700,000, for general fund debt sinking fund, \$350,000, for interest on constitutional loans for canal enlargement, \$720,000, for a constitutional loan sinking fund, \$450,000 (only to be paid from the revenues after payment of the item of interest on the debt as above), and for State expenses, \$200,000.

Concerning the practical results of legislative action looking toward the speedy completion of the Erie canal, its friends were disappointed. The Legislature had under consideration a bill by which \$3,800,000 would have been available, both for the payment of debts of construction, for land damages and for prosecuting the work to completion. But the two branches seem to have disagreed over minor details, with the result that adjournment came and the bill failed to become a law. The diver-

¹⁶¹*Senate Documents*, 1858, No. 134.

*So in the original.

sion, also, of the unexpended balances from the Erie enlargement funds to the laterals, as noted, left the work on the main line restricted for lack of means.

However, under the provisions of chapter 263, as construed by the canal commissioners, work continued and numerous contracts were completed, final estimates given, and commissioners' drafts issued in payment. The aggregate of these drafts by the close of the year 1858 was estimated by the auditor at \$1,700,000 beyond the means appropriated for their payment. This state of affairs naturally led to sharp recriminations between these officials.

Three hundred and one separate contracts were in existence during 1858; 166 were completed and settled, amounting to \$4,441,914.35, which included the settlement of 28 contracts canceled by the canal board; 135 contracts were still existing at the close of the year. The whole amount of work not under contract was estimated at \$765,916.24.

An effort was made during the season to secure six feet of water throughout the entire length of the Erie canal, but the large amount of work necessary and the short time allowed for its accomplishment rendered it impossible to fully realize such a result. There were a number of places along the unfinished portions of the line where the full depth of six feet could not be reached in time for the opening of navigation (1859), and at other places the width obtained was not sufficient to allow heavily loaded boats of the largest size to freely pass each other. The State Engineer considered, however, that during the next season the six-foot depth could be entirely realized, with the full width of enlargement, while legitimately progressing with the work toward completion.

"Notwithstanding the amendment adopted in 1854," says Judge Lincoln, "the canals continued to be a troublesome element in State affairs. The adoption of that amendment did not prevent the introduction of others, and the agitation continued, and the dissatisfaction with the canal article found expression, not only in proposed amendments, but also in the project for a constitutional convention. In 1858, a petition was presented to the Senate reciting that there had been a great falling off in canal revenues, and a large increase in the expenses of carrying on the

government, thereby swelling up the taxes; therefore, with the view of relieving the people from the large amount now unnecessarily expended to sustain the executive and legislative departments, and to secure the honest and better administration thereof, the petitioners prayed that act be passed calling a convention to revise the Constitution, abolishing the executive and legislative departments of the government, and vesting their powers in the president, vice-president, and directors of the New York Central Railroad Company. This curious petition, signed by 86 persons, was presented on the 2d of March. It seems to have been taken seriously, and was referred to the committee on canals. On the 13th Mr. Stow, chairman of that committee, 'to which was referred the petition of citizens for a convention to revise the Constitution of the State,' reported a bill for that purpose. . . . According to the journal, the bill seems to have had its origin in the petition."¹⁰² The bill was passed, became chapter 320 and the question was submitted to the people in the following November, being defeated by the narrow margin of only 6,360 votes.

Governor Edwin D. Morgan assumed office at the beginning of 1859. He addressed himself to the Legislature upon the subject of the State finances as he found them, and which were again at this time so inextricably entangled with those of the canals as to be incapable of separate treatment. The funded canal debt at the close of the previous fiscal year was \$24,307,704.40, and the new canal debt was \$12,000,000. In addition there were outstanding commissioner's drafts of \$1,000,000; interest charges, \$955,000; other land damages, \$1,000,000; and to make good the contractor's reserve of 15 per cent, \$500,000. If his figures were correct, said the Governor, these additional items made a new debt against the State of more than \$4,000,000 for canals alone, without any estimates for their completion, a large part of which had been created without warrant of the Constitution, but which must, however, be met and paid.

The Governor believed that \$2,100,000 would essentially complete the system, except the removal of the Erie wall benches, which was not required for the immediate needs of navigation. The entire channel of the Erie could also be deepened to seven

¹⁰² *Lincoln's Constitutional History of New York*, Vol. II., pp. 233-234.

feet, at a cost of \$300,000, including \$25,000 for deepening the present channel through the Cayuga marshes; another \$150,000 would deepen the Oswego canal to six feet. An alternative plan would be to secure six feet of water on the Erie, the Oswego and the Cayuga and Seneca canals, and to proceed with the permanent work across the Cayuga marshes during the winter of 1859, at a cost of half a million dollars, and then to provide for the final completion of the canals by the spring of 1860. However, the Governor urged that, whatever course should be taken, the improvements should be pushed to a speedy completion, in view of the millions which had already been expended and the small amount required.

The estimated cost of the work remaining to be done to complete the enlargement of the Erie, the Oswego, and the Cayuga and Seneca canals, to complete the Black River and Genesee Valley canals, and to enlarge the locks of the Champlain canal, as given by the State Engineer, was at this time \$2,900,540.37, to which should be added \$467,135.58,—the amount of the 15 per cent retained from existing contracts by virtue of chapter 329, Laws of 1854. Referring to his estimates of March 24, 1858, for completion—\$4,955,777.14,—the State Engineer explained that, if the cost of completing the new Genesee Valley extension (\$88,333.70) should be added, making \$5,044,110.14, and from this gross sum be taken the 15 per cent retained (\$835,691.17), and the expenditures during 1858 (\$1,833,639.20), a balance of \$2,324,780.47* would be left. His present estimate exceeded this sum by \$575,759.90, made up of land damages, changes of plan, increased estimates, etc. These estimates, however, did not include the removal of wall benches on the 85 miles of canal completed according to plans adopted prior to 1848. He did not deem it necessary to remove these obstructions at this time. He believed that with needed funds the entire work could be finished by the spring of 1860. The most important part of the enlargement remaining to be done, and the only portion not then in use, was across the Cayuga marshes. It would require vigorous and unremitting labor at this point to bring the canal into use by the spring of 1860. The amount of work necessary to produce seven feet of water before the opening of navigation in 1859

*So in original.

would render the task difficult if not impossible. Moreover, six feet of water would enable experiments in steam navigation to be tried. The successful application of this new power, the completion of the canals, and the adoption of such a tariff as would secure the trade, were the hope of the canals, to successfully relieve themselves from the weight of debt and taxation, and to fulfil the high destiny they were designed to accomplish.¹⁶³

An effort was made at this time to induce the Federal government to bear a portion of the expense of our internal improvements, but with the usual want of success. The canal board and commissioners united in a joint memorial,¹⁶⁴ in January, 1859, reciting the expenditures already made by the State and the general benefits which had resulted to the commerce of the several States interested. They asked for a refunding of the expenditures upon the Buffalo pier and breakwater, which had always been kept separately and which then amounted to \$179,473, or, with interest added, \$230,300, and that the Government should properly protect, at national expense, the harbors at Buffalo and Oswego and the other harbors along the Great Lakes, which were used to shelter national shipping, or as ports of shipment for commerce designed to traverse the lines of the Erie canal. A concurrent resolution of the Legislature approved the purpose of the memorial.

The Senate seems to have had under consideration a plan for the further lengthening of locks to pass boats of 130 feet, instead of 97 feet, as they then did, by moving the lock-gates nearer to the end of the locks. But the State Engineer reported¹⁶⁵ adversely in answer to their inquiry, under date of January 22, 1859. His chief objections were the limitations at Lockport and the great expense of changing conditions there. As a compromise, he suggested that sliding gates could be substituted there, admitting boats 108 feet in length, but this was the utmost and was not recommended.

That the advocates of reimposing railroad tolls still possessed some vitality is shown by the fact that the Senate sought the opinion of the Attorney-General upon the question of the validity

¹⁶³*State Engineer's Annual Report*, 1859, pp. 7, 8, 10 and 12.

¹⁶⁴*U. S. Senate, Misc. Doc. No. 31, 2d Sess., 35th Cong.*

¹⁶⁵*Senate Documents*, 1859, No. 28.

of the act of July, 1851. He rendered an elaborate opinion¹⁶⁶ on January 21, upholding its validity mainly upon the broad ground of the "plenary power of the Legislature for purposes of civil government," quoting the opinion of Denio, J., in *People v. Draper*, 15 N. Y. R., 543.

It is obvious that the State finances were in a deplorable condition at this time. Indeed, the Comptroller frankly admitted that they must face the unwelcome fact that the treasury was empty. This had been the case for some time. The commissioners of the canal fund had therefore been driven to the necessity of making a temporary loan of \$200,000, in July previous, to prosecute work which could not be suspended without serious detriment to the public interests. They also said that the surplus revenues were insufficient to cover the requirements of section one, article seven of the Constitution, to provide for interest and sinking fund for the old canal debt. This loan they asked the Legislature to protect; these deficiencies they urged provision for, to prevent, as they said, the violation of public faith and the disregard of constitutional obligations.¹⁶⁷ Upon this appeal the Senate committee was divided, the majority¹⁶⁸ claiming that the commissioners had power to negotiate a deficiency loan on the credit of the sinking fund, under section three, article seven, while the minority¹⁶⁹ repudiated the power of State officials to borrow money to pay the interest on, or to "postpone" the payment of its debts, as unconstitutional and a dangerous precedent.

The canal and lock improvements having been followed closely by enlarged craft—as had invariably been the rule—the boats again crowded the dimensions both of the waterway and of its bridge clearances. The Legislature sought information from the commissioners concerning those bridges which had not nineteen feet clearance from the bottom of the canal. From their replies¹⁷⁰ we learn that twelve feet from water-surface was the minimum limit and that most of the bridges had been raised to that point. It was said that the approved size of boats for the enlarged canal was understood to be ninety-seven and one-

¹⁶⁶*Senate Documents*, 1859, No. 33.

¹⁶⁷*Senate Documents*, 1859, No. 107.

¹⁶⁸*Senate Documents*, 1859, No. 115.

¹⁶⁹*Senate Documents*, 1859, No. 119.

¹⁷⁰*Senate Documents*, 1859, No. 110.

half feet long, seventeen and one-half feet wide, and about fourteen feet high. Such must be the size of a boat which would carry barrels of flour, or other like packages of about equal weight and bulk, with greatest economy. A boat of this size, having no cargo, would have about one and one-half feet of draught, and consequently would stand out of the water about twelve and one-half feet. Lighter loads, of lumber and the like, would require more headroom, and eventually all bridges must be raised. But this was not considered essential at present, inasmuch as there was not seven feet of water in the canal.

As to the legislation of 1859, aside from the concurrent resolution already noted, chapter 495 was an effort to remedy some of the existing evils by curtailing the powers of the canal board and commissioners, prohibiting certain acts, among which were the canceling of contracts, except upon the contractor's application and the making of extra allowances to contractors. Chapter 221 appropriated for maintenance, \$900,000; for deficiency of the previous year, \$228,878.91; canal debt and interest, \$1,700,000; general fund debt sinking fund, \$350,000; and for State expenses, \$200,000. Chapter 372 imposed a five-eighths-mill tax for the canal fund, from which there was appropriated for Erie enlargement, \$412,150; Oswego enlargement, \$138,640; and sundry other sums for the laterals, and for interest on commissioners' drafts and other items of floating indebtedness; the money was not to be used for the payment of "back debts," and no drafts were to be made in future except upon available monies in the treasury; the commissioners were further prohibited from spending any more money across the Cayuga marshes, except to maintain the old line of the canal. Chapter 326 reappropriated certain balances of \$330,726.43 to enlargement purposes, under stringent limitations as to its expenditure.

The whole trend of this legislation seems to have been to stop every possible avenue of extravagance or mismanagement which had been the subject of complaint. It was later said of this period, by Governor Morgan, that the people had authorized a new loan of \$2,500,000 to pay the "floating debt," but, while they had ever been prompt to meet all just obligations, "they [would] not be likely again to sanction the payment of any

debt not authorized by the Constitution and the laws, no matter for what purpose, or under what circumstances incurred. The act of April 6, 1859," he continued, "which prohibits the creation of any similar obligations in future, doubtless contributed much to induce the people to authorize the payment of those which existed." He advised attaching a penalty to the creation of any such indebtedness in future, to "prevent the people from ever again being placed in the dilemma of paying an unauthorized debt or seemingly incurring the stain of repudiation."¹⁷¹

On April 1, 1859, all the remaining sections of the canals were put under repair contracts. The aggregate sum per annum was \$252,292, with \$20,000 for superintendence. The Governor believed, however, that this sum was below its fair worth; including lock-tending, it should be in future estimated at about half a million dollars, which sum would maintain the canals in as good condition as when completed.¹⁷²

The canal auditor substantially agreed with him, that it was not expected that annual repairs could be maintained for the amount of the contracts, but for \$400,000 the canals could be kept in as good repair as they were for twice that sum in the hands of superintendents. If the contracts had not been made, the cost of maintenance would have exceeded a million dollars.¹⁷³

During 1859, 73 contracts were completed and settled, 18 new ones were made, leaving 80 existing at the close of the year. The enlargement of the Erie was so far advanced that the estimated amount of work remaining to be done was \$675,019.25, and, in the opinion of the State Engineer, the whole work could be so far performed by the opening of navigation in 1860, as to give the full depth of seven feet of water the entire length of the canal.

A comparative view of the traffic on the canals, presented by the auditor's report covering that period, shows, between the years 1856 and 1859, a startling decrease in tonnage of 334,409 tons carried, and of \$964,461 in tolls. Of this latter item the auditor attributed three-quarters of a million dollars to the reduction in rates since 1857.

¹⁷¹*Governor's Annual Message*, 1860, p. 2.

¹⁷²*Id.* p. 4.

¹⁷³*Auditor's Annual Report* for 1859, p. 9.

The contract repair system, under which the canals were now being almost entirely governed, was fairly on trial, and while it was hoped that the system would ultimately prove to be all that could be desired, yet it was so far open to some criticism by the canal commissioners. The clause requiring the award to be made "to the lowest bidder" was objectionable. This often meant too low an amount for profit to the bidder, in which case there was a subsequent abandonment, without sufficient recourse for protection. Additional precautions in the way of deposits for security, they thought, should be exacted, together with increased vigilance on the part of the State over the execution of the contracts.

The Comptroller began his annual report with the pregnant statement that "nearly all the demands upon the General Fund [had] been paid, and the State, by the adoption of the loan law submitted to the people at the recent election, relieved from the disgrace of a floating debt accumulated in violation of the Constitution."¹⁷⁴ The reference was to chapter 271, Laws of 1859, "An act to submit to the people a law authorizing a loan of \$2,500,000 to provide for the payment of the floating debt," passed April 13. He continued: "There were many reasons of an equitable character which rightfully operated to induce the people to assume and pay this debt. Whilst the result exhibits a gratifying preponderance of sentiment in favor of fulfilling even doubtful obligations, yet with no organized or ostensible opposition to it, the vote of 77,466 against it, out of an aggregate vote of 202,836, will, it is hoped, have a salutary effect . . . in preventing a repetition of the experiment."¹⁷⁵

The State Engineer presented revised estimates of cost, on January 1, 1860, for completing the canals, "according to law," as he termed it. These estimates amounted to \$1,679,686.69, which was a slight diminution from the previous year's estimates. The Cayuga marsh section embraced the most difficult work yet remaining. When completed, the downward lockage at either end of the marsh level would be dispensed with, and the extension of the higher level across the marsh was expected to give safety and expedition to the movement of boats, if the work was not

¹⁷⁴*Comptroller's Annual Report*, 1859, p. 1.

¹⁷⁵*Id.* p. 18.

discontinued for want of means. The estimated cost to complete the work was \$47,000. The Assembly made inquiry, during its session, concerning the progress of this improvement, and the State Engineer, on March 3, 1860, strongly urged the completion of the drainage plans, in view of the fact that it was almost completed and that it would remove all cause of complaint as to the obstruction caused by the embankment of the new canal.¹⁷⁸

Double enlarged locks were by this time completed and in use on the line of the Erie canal from the Hudson river to the Cayuga and Seneca canal, and from this latter point single enlarged locks to Lake Erie, except at Macedon and Lockport, where they were double.

Historians tell us that at this critical period of affairs State issues were becoming involved and lost sight of in national questions, among which slavery was paramount. The Harper's Ferry raid in October kindled the blaze of civil war, which thereafter occupied the attention of the people.

Governor Morgan's annual message of 1860 administered a stinging official rebuke to those canal officials who had contracted the "floating indebtedness" of the previous year, in defiance of the Constitution or of law. He said that he considered that the matter of reduction of tolls for the past few years "to meet railroad competition" had been overdone, that reduction, instead of increase of revenue, had been the result, and that a readjustment should take place. He strongly urged the completion of the canals to a full seven feet in depth by seventy in width, before the opening of navigation in 1861. He said that \$1,658,969.37 would be needed to complete them, only one-half of which sum could, however, be advantageously used in the pending year. He recommended the restoration of tolls to the rates that existed prior to the reductions of 1858 and 1859, and he also advocated the reimposition of railroad tolls, at least for a period, until the canals should be completed.

But the Legislature was dilatory in acting upon the suggestions of the Governor and in the latter part of February he addressed them a second time in a special message as to the necessity of increasing canal revenues, again urging the reim-

¹⁷⁸*Assembly Documents*, 1860, No. 101.

position of railroad tolls as a means of obtaining that result.¹⁷⁷ The Legislature then gave its attention to the subject, so far at least as to again request the Attorney-General's opinion regarding the constitutionality of the act of 1851. In his opinion, given at the conclusion of a careful historical review of the canal policy of the State from its inception, he considered that the act *was* a "diversion of the canal revenues," and as such was unauthorized, "unconstitutional and void."¹⁷⁸ This conclusion was diametrically opposed to that of his predecessor, already noted. The majority of the ways and means committee also concurred in this view of the matter,¹⁷⁹ but without accomplishing the result desired.

Before the completion of the costly and long-delayed enlargement could be effected, and long before the heavy indebtedness which it had caused could be paid off or even reduced by the tolls from the increased volume of expected traffic, forwarders and boat-owners were close upon the heels of the improvements, clamoring for still further facilities. Under chapter 213, Laws of 1860, the "big bevels" were ordered removed from the locks in which they occurred throughout the line, and the remaining bridges raised to a minimum clearance of twelve feet above water-surface. It was now complained that on the old "wall-bench" sections the bottom of the canal was obstructed by an accumulation of detritus from these disintegrated benches and from worn tow-paths, until scarcely six feet of water could be obtained, instead of the promised seven. It has been noted already that builders of boats, anxious to utilize every inch of canal and lock section and carry every possible ton of cargo, had enlarged their boats to such proportions that many of the same difficulties, of which they complained before the enlargement, now confronted them, except upon a larger scale. The western division of the Erie, it has been said, still had single locks, while the middle and eastern divisions, where the added traffic of the laterals was encountered, possessed double locks throughout. Larger lock capacity was demanded. The propriety of still further lengthening to increase the capacity throughout the canals, which later

¹⁷⁷*Senate Documents*, 1860, No. 48.

¹⁷⁸*Assembly Documents*, 1860, No. 172.

¹⁷⁹*Senate Documents*, 1860, No. 35.

in their history became an accomplished fact, had been discussed already. The State Engineer, however, advised finishing the enlargement first, as planned, prior to entering upon any additional improvements. Some experiments had been made with single gates set at the curve of the lock walls, both above and below the existing pairs, but these were not considered successful. The enormous expense of lengthening the lock walls and foundations was an objection, and the report of the State Engineer, adverse to the project, held it in restraint for the time being.

The net results of legislation for the session of 1860 were as follows: chapter 63 appropriated from the revenues, for collections and salaries, \$800,000; for old debt, \$1,700,000; general fund debt sinking fund, \$350,000; interest on constitutional loans for enlargement, \$760,000; sinking fund for same (if anything was left from current revenues), \$406,243; State expenses, \$200,000; and from the tax of the previous year to pay the floating debt loan of \$2,500,000, for interest on loans, \$150,000, and for sinking fund, \$243,055. Chapter 494 imposed a one and one-eighth-mill tax to increase the revenues sufficiently to pay the State creditors to the amount of \$1,860,050, "or so much thereof as should be required." Chapter 213 provided for a half-mill tax in 1860 and in 1861, to complete the canals, supply them with water, etc.; the water-supply of the Rome level was to be increased; the Erie canal was to have full seven feet of water throughout; the big bevels were to be cut from the locks so as to give eighteen feet width on the miter-sills; all bridges were to be raised to at least twelve feet clearance; the entire work was to be closed up by June 1, 1861; and the engineering force reduced to a maintenance basis of three division or three resident engineers.

The canal auditor's report for 1860, p. 7, showed a marked improvement in tolls—\$604,297.59—over those of the preceding year, and a decrease in expenses also of \$170,902.93, making a total saving of \$784,199.52,* which was encouraging. The revision of tolls in April of 1860 had resulted in a decided increase of the revenues. No tonnage had been lost by the partial restoration of the rates of 1857, as had

*So in original.

been insistently claimed by the opponents of revision, and none would have been lost, in the auditor's opinion, by their entire restoration.

Meantime a revised estimate (\$700,000) had been given by the State Engineer of the cost of the work remaining to be done on January 1, 1861, to complete the canals, exclusive of land damages. During the year 1860, 28 contracts were completed, and 24 new ones were made, leaving 76 contracts existing at the close of the year.

Governor Morgan extended his congratulations to the Legislature of 1861 upon the approach of the end of the enlargement, although it had been accomplished at too great a cost and quite too long delayed. Before the conclusion of their labors, he said, "New York [would] possess, finished and complete, a system of internal works unequaled both for capacity and extent in this or any country."¹⁸⁰ The net gain in increased revenues and decreased expenses, he continued, of the past fiscal year over the preceding one was about three-quarters of a million dollars. The Governor renewed his two suggestions of the previous year; one of them, the increase of tolls, had been acted upon with beneficial results; the other, reimposing tolls upon railroads, he again urged upon their consideration.

On February 21, 1861, the canal board petitioned the Legislature to repeal section three of chapter 213, Laws of 1860, requiring a reduction of the force to three division engineers, and urged that it be left to the judgment of the board,¹⁸¹ but an examination of the statutes of that year fails to disclose that affirmative action was taken upon the request.

But little canal legislation appears to have been placed upon the statutes during the session of 1861. There seemed to be a disposition to "let well enough alone," at least for a period. The long-deferred enlargement was indeed approaching its conclusion; the system of repairs and operation under contract, while developing some objections so far under practical experience, was yet believed to be capable of being improved in its details, so as to render it more satisfactory. It was beyond question the most economical method yet devised, but the accumulated dilapidations,

¹⁸⁰*Governor's Annual Message*, 1861, p. 5.

¹⁸¹*Senate Documents*, 1861, No. 41.

resulting from contractors' efforts to save money by using temporary makeshifts and failing to thoroughly maintain the work at its initial standard, were possibly not so thoroughly realized as they were a few years later. The commissioners, indeed, in their report¹²² for 1861, discussed the system and its faults, criticising the way in which it "worked out." As one official very pertinently put it: The contractors' first idea was, "Will these structures hold together until my contract expires?" and repairs were made in the cheapest possible manner, resulting in a general deterioration of the entire section. The less he expended, the more he would save, his compensation depending upon the *time expended*, rather than upon the amount of *labor performed*. After he found himself facing the accumulated results of his neglect for a series of years, with but a further loss in sight, abandonment, followed by an appeal to a complaisant Legislature, furnished the relief sought for from further responsibility. It was charged that of all the contracts abandoned, not a single judgment against a contractor or his sureties had been so far collected and paid into the treasury, as provided by the law.

Again, as other reasons for the comparative lack of aggressive canal legislation, there may be considered the steady increase of tolls and the hope that this increase and the lapse of time would improve conditions. National events, too, were of such grave significance as to completely overshadow other and more local issues.

Delays at the five locks of the middle division which were upward lifts to east-bound boats, by reason of the difficulty of disposing of the surplus water in the chamber on entering the lock, were noted by the commissioners in 1861. Boats had grown too large for the chambers and the only escape for the water was underneath. This and the current were objectionable. A stationary engine of five or six horse-power was suggested. In later years this difficulty was overcome by widening the locks and also by the use of a turbine wheel operating a system of haulage by ropes. It may be explained here that during the enlargement the size of boats had been increased from about seventy by fourteen feet, as they were upon the old canal, to about ninety-eight by eighteen feet. The draught had likewise increased from three

¹²²*Senate Documents*, 1862, No. 26, p. 89.

feet six inches to five feet nine inches, and the cargo from seventy-five to nearly two hundred tons.

At the close of the fiscal year the State Engineer again estimated the cost of work remaining to be done on September 30, 1861, to complete the unfinished canals according to law, at \$390,000, exclusive of land damages. This estimate did not include an item for "bottoming out" the canal at various points, mostly in the western division, and which was then caused "by an error in the original base or bottom line of the canal." It was thought that \$75,000 would cover the expense.

At the close of the fiscal year (1861), 14 additional contracts had been settled, 19 new ones entered into, leaving 80 still existing. The bridges upon the eastern division had been raised, and the big bevels of the locks were practically removed from the entire line, under the provisions of chapter 213, Laws of 1860. The slope wall benches, or "bermes," while causing considerable inconvenience in navigation, especially towards tide-water, were not provided for by an appropriation for their removal, and were left untouched. The Cayuga marsh embankment was reported as substantially completed, and carrying seven feet of water.

As to the lengthening of lock walls and foundations, the estimate was placed at more than one and one-quarter millions, and as the canals were deemed capable of doing twice the business of the previous year and of producing a revenue, at existing rates, of over six million dollars, it was considered unwise to disturb existing conditions.¹⁸³

The increase of tolls for the season of navigation in 1861 gave a still brighter aspect to the situation, the increase in revenue being \$899,188, and amounting to \$3,908,785. Certificates of registry for 619 new boats were issued, with an aggregate tonnage of 95,230 and an average of 154 tons. A comparison of the figures given show that the net tolls of 1860 were nearly double, and those of 1861 more than three times the tolls of 1859, or since the rates had been largely restored to a revenue basis. The trouble seems to have resulted from the failure of the canal board and Legislatures, during the previous period of low tolls, to resist the powerful

¹⁸³*State Engineer's Annual Report, 1861, p. 36.*

and continued pressure of shippers, who were constantly urging low rates for the benefit of their own pockets, regardless of their effect upon the revenues of the State and of its ability to pay its constitutional debts as they matured.

It was fortunate and timely in one aspect—that of the canal revenues—that the tolls had been brought back from their low rates of 1857–8, and that the general circumstances of the country favored an increased traffic at this juncture. The opening of the Civil war and the early closing of the gateway of navigation by way of the Mississippi left New York as the only route for the products of western agriculture to its markets. Both the railways and the canals reaped rich benefits from these conditions and the tolls of the latter reached the maximum figures so far in its history. The auditor differed somewhat in his reasons, denying that the increase was from western grain, or that New Orleans was a shipping port for bulk grain. His tables show a gain in “vegetable foods” of over one and a quarter million dollars, nearly half of which came from increased rates on wheat, corn and flour in the spring of 1861.¹⁸⁴

Governor Morgan speaks of this increase of revenues, in his message of 1862, as an encouraging exhibit in view of the “years of taxation and disappointment in relation to the cost and income of the canals.”

In February of that year, the canal board, replying to a legislative inquiry, advised beginning the construction of thirteen locks, in order to double those on the line between Montezuma and Rochester at an estimated cost of \$412,000, together with a guard-lock at Black Rock at a further cost of \$35,000.¹⁸⁵

As we have seen, State Engineer Van R. Richmond, still standing against the outside interested pressure for further expenditures and facilities and demanding that the revenues be given an opportunity to pay or reduce the debt of the State, for which they were pledged, strongly maintained that the traffic so far had not reached and for years to come would not reach the ultimate capacity of the canals as they were. In support of this, he said that competitions showed that the original plan, when completed, would furnish ample facilities for

¹⁸⁴*Assembly Documents*, 1862, No. 112, pp. 13 and 14.

¹⁸⁵*Assembly Documents*, 1862, No. 92.

delivering to tide-water through the Erie canal 5,220,000 tons, or a total movement of 10,665,011, and a revenue, based upon the rates of 1860, of \$6,902,318. It followed, he argued, that no immediate necessity of further enlargement existed, either by lengthening lock-chambers, enlarging the prism by removing wall benches, or by any other method. The plan of these wall benches had been changed in 1848. Prior to that time about 80 miles had been so constructed. Its removal would necessitate an expenditure of \$968,000 and it would enlarge the cross-area but little more than six per cent. There had been for several years, he said, a manifest disposition to proceed with the works in question. But in view of the debt for the canals then resting upon the people, he could not approve the expenditure for further or re-enlargement, until the completion of the unfinished work and increased business should have given evidence of its necessity.¹⁸⁶

By the terms of chapter 169, Laws of 1862, passed April 10, the first enlargement of the canals of the state was officially declared completed, although, as a matter of fact, much remained to be done to render them so. This remarkable internal improvement stands out unique in their history, from the fact that its finances were so closely interwoven with the financial policy of the State, and its management was so dominant a factor in its political struggles. For more than a quarter of a century, for one reason and another, had its continuance been prolonged and its completion deferred, until by the passage of this act all contracts contemplated by section three, article seven of the Constitution were ordered closed by September 1, following, after which no work should be done nor material furnished "under pretence of enlarging and completing" the canals, and the powers of the contracting board were to cease.

Other canal legislation of this year, aside from appropriations, was, with a single exception, unimportant. The canal board was authorized by chapter 415 to enlarge the locks of the Erie and Oswego canals so as to permit vessels adequate to the defense of the Lakes to pass, whenever the General Government should supply the means. Such vessels and their supplies and munitions of war were to be forever free of tolls.

¹⁸⁶*State Engineer's Annual Report, 1861, pp. 30-39.*

CHAPTER IV.

LATER IMPROVEMENTS OF THE ERIE.

From the completion of the first enlargement in 1862 to the beginning of the second enlargement in 1895.

As we have just seen, under the provisions of chapter 169 of the laws of 1862, the Legislature declared the enlargement of the canals completed. The improvement which, with some interruptions, had been carried on since its beginning in 1836, and which we now call the "First Enlargement," was officially declared closed—as being the only way left open to the State to determine the end of the expenditures and frequent changes of plans theretofore made under the guise of "completing the enlargement." The ever-increasing demands of a growing traffic and the protracted period of executing the improvements had added much that was not contemplated in the original project. By the terms of this act, all outstanding contracts were to be completed prior to September 1, 1862, and all accounts therefor closed as soon as possible thereafter; no work could be done nor material furnished after that date, under pretense of completing or enlarging the canals, and all powers of the contracting board in regard to the enlargement should then cease. The engineering force was reduced to one engineer and one assistant engineer upon each division, though, if necessary, temporary engineers might be employed on some specific work. Engineers were required to file a bond and oath of office, and their services were confined strictly to repairs and maintenance of the "completed" canals. The work then in progress under the act of April 9, 1860, on the Champlain canal and Glen Falls feeder was especially exempted from the provisions of the act.

This sweeping change of policy in the administration of canal affairs, however, left the enlargement of the canals far from actual completion. Much work remained to be done to place the uncompleted parts of the line on an equal basis of capacity and

condition with the portions already enlarged and improved. The eastern and middle divisions were practically completed, except two contracts; the deficiency was mainly on the western division. Thirteen locks and a guard-lock on that division still remained to be improved, at an estimated cost of \$447,000, while other needed improvements on that division would cost \$170,000. Of the locks that had been doubled during the enlargement—that is, a second lock placed side by side with the original lock, permitting the passage of boats in both directions at the same time, thus doubling the capacity for traffic—fifty-seven were completed, while fourteen (exclusive of the Black Rock guard-lock) yet remained to be similarly improved. The De Ruyter reservoir, one of the important feeders of the long Rome level extending from Utica to Syracuse, was left uncompleted on September 1. The sum of \$32,110 would be required to finish it, and the frequent scarcity of water on that level required the work to be done. The deficiency in amount of water at the Lodi lock (No. 47), at the western end of the Rome summit level, frequently restricted its capacity for lockage during the dry season. It was proposed to obviate this difficulty by a change of grade for a distance of fourteen miles east of the lock, commencing at the Chittenango feeder and gradually deepening the bottom to the lock, the increased depth being fifteen inches at that point, thus increasing the current and the supply of water for lockages. On the western division there were needed also heavier banks, their former construction having proved too light to sustain the pressure of the increased depth of water. These were to be widened and strengthened, bridge embankments were to be built out to proper proportions, and numerous slope walls were required. On the western division there was required also a large amount of bottom to be excavated before the enlargement could be completed.

On certain portions of the canal that were nominally finished there existed a form of construction—slope walls on benches—which had to be changed to a wall of full length. This alteration was never considered a part of the enlargement, although it was rendered necessary by that undertaking, and many miles were rebuilt after 1862. In the eastern division alone there were seventy-five miles of these slope walls, constructed upon an

earthen bench that averaged four and one-half feet above the bottom of the canal. There were serious objections to this method of construction. It gave only forty-two feet width of canal-bottom, which permitted the passage of but two boats at a time. Loaded boats could not get nearer than about eighteen feet to the top of the bank, and when both shores were thus occupied, no space remained for a third boat to pass between. These earthen benches had also become disintegrated and had washed away, filling the canal with debris and in many cases permitting the superincumbent slope wall to slide bodily into the bed of the canal. Traffic was thus materially restricted, and it was proposed to reconstruct these slope walls, extending them to canal-bottom and giving a width of fifty-two and a half or fifty-six feet on bottom, according to the slope of bank adopted. This would permit the passage of three loaded boats abreast. These walls had been constructed prior to 1842, but after the Constitution of 1846 had allowed the resumption of operations, a plan for full length walls had been adopted.

By the system then in vogue, repairs were let by contract, for a gross sum, to maintain the canals in a navigable condition. This was deemed highly objectionable by the State Engineer. Temporary repairs and makeshifts were introduced, where permanent repairs should be made, and numerous claims for masonry work, done outside of the contract, were made. A change to the unit system of paying for repairs, as in construction, was advocated.

The Civil war was then at full tide. Pennsylvania was invaded and New York escaped a similar disaster only by the quick rushing of many thousands of its troops to the aid of its sister State. The blockade of the lower Mississippi by the Confederate forces had turned the traffic in western grain to find an outlet to the eastward. The suspension of specie payments, draft riots and the depletion of the working forces of the state by enlistment added to the complications of the period, and all had a bearing upon the policy concerning canal affairs. In view, also, of the loss of trade with the southern states, the Executive of the State called attention to the necessity of providing for the accession of commerce from the West, which then constituted eighty per cent of the traffic of the canals.

The probability also, at this time, of a war between the United States and Great Britain aroused the apprehension of the inhabitants of the cities located on the Great Lakes, as to the consequences to them, in case of active hostilities. Shortly after the treaty of Ghent, a supplementary treaty was made between Great Britain and the United States, by the terms of which each government could maintain as a naval force but one boat on Lake Ontario and one on Lake Champlain and two boats on each of the upper Great Lakes—the boats not to exceed one hundred tons burden, and the armament of each not to exceed one eighteen pound cannon. It was considered that the United States would have no way of bringing war-ships to the lakes to protect the many wealthy and prosperous cities along their shores, while Great Britain had so improved her waterways that she could bring a large fleet of war-ships up the St. Lawrence and place our lake cities at her mercy. It was proposed, therefore, to enlarge the Erie, Oswego and Champlain canals and their locks, to permit the passage of boats adequate to defend the northern and northwestern lake coasts. Other schemes were also proposed for bringing vessels from the Mississippi to the harbor of New York. Among them were projects for a ship canal around Niagara falls, together with the enlargement of the canal locks from Oswego to Albany, and the enlargement of the Champlain canal, with better connections between Lake Champlain and the St. Lawrence river.¹

An Assembly resolution of March 7, 1862, directed the State Engineer to examine the Champlain canal with a view to enlarging it to pass gunboats through Lake Champlain from the Hudson to the St. Lawrence and Lake Ontario. In answer to the resolution, the report² of the State Engineer to the Legislature on March 28, 1862, gave \$815,000 as an estimate for enlarging the Champlain locks to twenty-five feet in width, admitting boats one hundred and fifty feet long, while the cost of enlarging the prism and mechanical structures to the same size as the existing Erie canal would be \$2,157,900; engineering and land damages would add \$797,290, making a total of \$3,770,190. On March 13, 1862, the Assembly also instructed the State Engineer to make.

¹*Governor's Annual Message*, 1863.

²*Assembly Documents*, 1862, No. 174.

at the earliest possible moment, an estimate of cost and to report concerning the feasibility of an enlargement of one tier of Erie locks to twenty-five feet width and one hundred and fifty feet length, in order that the General Government might consider that route in connection with the subject of lake frontier defence. The Oswego canal was later included by request. The estimates were: for the Erie, \$2,815,900; for the Erie and Oswego route, \$3,441,400. The Assembly considered these reports and adopted a resolution referring the matter to Congress, urging an appropriation.³

The Legislature of 1863 again passed concurrent resolutions, authorizing surveys and estimates for a tier of locks to be located at the side of or near the existing locks on the Erie, Oswego and Champlain canals—the new locks to be not less than two hundred and twenty-five feet long and twenty-six feet wide, and to be calculated for seven feet of water in the canal. Other resolutions were also passed, reciting the benefits of such locks to the General Government and its probable desire to secure the right of perpetual passage through the canals, free of tolls, for vessels, troops and munitions of war, and to render a fair equivalent by contributing justly toward the cost. The Federal Government was requested to detail a competent consulting engineer, and Hon. Charles B. Stuart, who had been the first incumbent of the office of State Engineer and Surveyor of New York, was so appointed. The Legislature provided for the expenses of the survey by appropriating twenty-five thousand dollars (chapter 311). The canal board directed surveys to be made upon the Oswego and Erie canals, but omitted the Champlain canal. This was known as the survey for “Gunboat locks.” The report⁴ of the State Engineer to the Legislature, with estimates of cost, was submitted on February 4, 1864. The estimates for this latter survey, it will be observed, were for much larger locks than required by the estimates of 1862, and though not included in the resolutions, it was deemed essential to add the cost of deepening the prism to eight feet of water, to accommodate the draught of gunboats contemplated to be used. The estimates were as follows: for the Erie canal, entire length, one tier new

³*Assembly Documents*, 1862, No. 190.

⁴*Assembly Documents*, 1864, No. 179, pp. 113–203.

stone locks, \$11,902,888.15; removing bench walls, \$1,784,185; deepening one foot, \$1,789,900; land damages, \$425,000; total, Erie canal, \$15,901,973.15. By the route via Syracuse and Oswego, similar items aggregated: from the Hudson to Syracuse, \$10,399,198.15; and from Syracuse to Oswego, \$2,743,000.

From the canal auditor's report for the fiscal year 1862, we learn that the revenues, other than from taxation, were \$4,854,989.67. The expenses of ordinary repair and maintenance were \$773,388.32. The total canal-stock debt on September 30, 1862, was \$23,981,610.25, on which the annual interest was \$1,381,970.76. The sinking fund for redemption of this debt amounted to \$3,532,784.32. There were five thousand five hundred and sixty-eight boats in use on the canals, of which eight hundred and fifty were registered as new. The total tonnage for the year was 5,598,785, an increase of 1,091,150 tons over 1861.

In the ensuing year, 1863, the tolls fell off during the latter part of the season about half a million dollars, owing to the breaking of the Mississippi blockade. The total receipts were \$5,118,501.35, and ordinary repairs and salaries cost \$770,882.52.

During 1863 the policy of widening the canal by removing the objectionable wall benches was inaugurated, but at the close of the year there still remained to be removed over eighty-seven miles of such benches, of which seventy were in the eastern, fifteen in the middle, and two and one-quarter in the western division. In addition to this, in the western division there still remained, to complete the enlargement, a large amount of bottom excavation, weak embankments to strengthen, slope walls to build where needed and, as equally necessary, the doubling of locks already described. The De Ruyter reservoir was practically completed and its added supply of water greatly benefited the long summit level. The canal commissioner of the middle division was instructed to cause that portion of Nine Mile creek feeder from the Erie canal to Camillus to be made navigable for boats plying on the enlarged Erie canal.⁵

The geographical position of our State had, at all times, drawn the greater share both of foreign commerce and of interior exchanges in the United States. This concentration of trade was

⁵*Laws of 1863*, chapter 72.

commented upon by Governor Fenton in his message, in which he stated that it had increased since the war began, in consequence of the closing of southern ports and the stoppage of trade on the Mississippi. Not only had this tendency become more decided, but the volume of trade had increased, both foreign and domestic, contrary to the predictions of the enemies of the Union and to the surprise of its friends.⁶

In 1864 the work authorized by the canal board, under the head of extraordinary repairs, was generally finished, including the dam across the Genesee river. The dam across the Mohawk river at Rexford Flats, four miles below Schenectady, was not completed. The benefits arising from the removal of the wall benches were becoming more apparent, and every year's experience in operating the canals proved that these benches should be removed and the capacity of the prism increased to meet the requirements of navigation. During this year the Legislature appropriated \$75,000 for the purpose of constructing two stone side-cut locks in the village of West Troy.⁷ The supply of water from the completed De Ruyter reservoir was found to be insufficient for the needs of the canal and the construction of Fish creek feeder was advocated. Locks built prior to 1842 had been constructed upon a bed of gravel, which had become undermined and was troublesome. Later construction had been upon a concrete foundation. During 1864 some of these gravel foundations had been repaired with concrete, and it was urged that the old locks should be examined and repaired if necessary. The removal of earth and rock from the bottom of the canal in the western division was carried on extensively during the winter.

The gross receipts from canals for the year 1864 were \$4,346,265.52, and the expenses of repairs and maintenance were \$1,028,909.46. Increased prices, of course, increased the cost of repairs and maintenance, and it was felt that this must continue until the resumption of specie payment. The interest-bearing canal-stock debt on October 1, 1864, was \$21,127,810.25, on which the interest per annum was \$1,206,262.76. The sinking-fund balance for its payment was \$4,841,130.49. The gross tonnage on the canals for the year was 4,852,941. Three hundred and ninety-nine boats, old and new, were registered.

⁶*Governor's Annual Message*, 1864.

⁷*Laws of 1864*, chapter 354.

In 1865 a change was made in the rank of engineers on canal work. Pursuant to chapter 169 of the laws of 1862, each of the three divisions had been in charge of "one engineer and an assistant engineer," from September 1, 1862, to April 17, 1865. At this time, by virtue of chapter 477, Laws of 1865, the act of 1862 was so amended that these engineers should rank as division and resident engineers, their appointment being invested in the canal board, and their duties being prescribed by the State Engineer and Surveyor. During the year further progress was made in the removal of the objectionable benches and at the close of the year only about fifty miles remained, all of which was in the eastern division. According to the State Engineer, the absolute necessity of providing an additional supply of water for the Jordan and Port Byron levels was by this time fully realized. The appropriation of a part, or the whole, of the waters of Owasco creek would enable navigation to be more continually maintained.

At lock No. 39, in Little Falls, a new form of gate called the submerged or "tumble-gate" was tried with gratifying success. This form of gate became quite popular later, wherever circumstances would permit its introduction to displace the ordinary swing or miter-gate, the advantages being the lowered cost of construction and operation and a substantial increase in the length of the lock-chamber without lengthening the walls. It superseded the upper pair of gates, opening up-stream by dropping flat, below the breast wall, the boats passing over it. A wooden quoin-post, with iron journals, fitted into sockets in the walls. The post turned within a hollow quoin, laid horizontally. The gate was loaded with stones to sink quickly, and was operated by chains and gearing at the side. The hollow quoin rested upon an open timber framework in place of the usual miter-sill wall. A platform extended from the hollow quoin to the breast wall, through which horizontal valves permitted the water to drop through the platform and pass to the lock-chamber. It was claimed that its operation caused less commotion in filling the lock, boats rising steadily and upon an even keel; also that one man, operating a single set of machines, would suffice for either single or double locks.

For the fiscal year 1865 the canal revenues amounted to \$3,577,465.45, while the expenses for ordinary repairs and maintenance rose to \$1,927,373.59. The canal debt was \$19,424,585.49, upon which the interest charges were \$1,105,249.28. The great cost of the breaks of 1865, which necessarily called for large outlays in addition to the ordinary expenses, was chiefly the cause of the immense increase for repairs and maintenance. The tolls received amounted to \$3,839,955, while the entire tonnage amounted to 4,729,654. The number of boats registered during the year was two hundred.

The subject of a canal between Lakes Erie and Ontario, built upon New York ground, was at this period receiving considerable attention from canal advocates. The initiative seems to have come from certain commercial conventions in the West—notably at Detroit in July, and at Morris, Illinois, in November, 1865, where it was urged that cheaper grain rates by way of such a canal and the St. Lawrence should be secured. In Congress a charter was sought, backed by legislative action in some western states toward this end, and a bill had already passed the House, offering the loan of six millions in six per cent twenty-year bonds to any company incorporated by any State that would undertake its construction. The General Government was to enter upon and acquire the necessary lands and rights by the power of eminent domain and to transfer them to the corporation when organized. The support came from Massachusetts and the East, which wanted to buy cheap flour, and from the West, which wanted to sell dear wheat, regardless of its effect upon the prosperity of our own State, which had already expended vast sums upon its canal system, largely for the benefit of its neighbors, and whose recent request to Congress for aid in further improvements had been refused. It was then deemed impossible to enlarge our own system to meet the requirements of the proposed ship canal around Niagara falls, which provided for ninety feet bottom and one hundred and five feet surface width, twelve feet of water, and locks two hundred and seventy-five by forty-five feet. Even if our canals were enlarged, the largest vessels could not then pass the Hudson, and would, therefore, seek a foreign channel through the St. Lawrence river. In reply^a to

^a*Assembly Documents, 1866, No. 172.*

Assembly resolutions of inquiry on March 12 and 26, 1866, the canal board and the auditor denounced the proposed project in vigorous terms, as being more or less destructive to the prosperity of the canal system of the State and the commerce of the City of New York. It was at the same time urged that the immediate enlargement of the Erie and Oswego canal locks would abundantly provide for any probable traffic.

It is, perhaps, needless to add that the Niagara ship canal has never been built. The project originated under cover of its necessity as a measure for national defence. In 1863 President Lincoln had appointed Charles B. Stuart, C. E., to make report and estimates for a gunboat canal of twelve feet depth, and this report was published as H. doc. 51, 38th Cong. 1st sess. 1864. No action was taken until 1867, when surveys were made for the United States by James S. Lawrence, C. E., and Stephen S. Gooding, C. E. Six different lines were surveyed; three from Lewiston on the Niagara river, and three from Lake Ontario; all being for a depth of fourteen feet. These were published, with maps and profiles, in the report of the Chief of Engineers, U. S. A., pages 217 to 287, 1868, and again as part of H. rp. 1,430, 51st Cong. 1st sess. 1890.

For the year 1866 the total canal tonnage was 5,775,220. The canal revenues were \$4,309,746.12, while the expenditures were \$1,434,989.73. The debt was reduced to \$18,166,600, upon which the annual interest charge was \$1,035,330. The sinking-fund balances, applicable to the payment of the debt, were \$2,563,623.23. The season of navigation was from May 1 to December 12, or two hundred and twenty-six days. At the close of the season there still remained sixty-nine miles of wall benches in the eastern division, producing a congestion of traffic at the locality needing the most space of any, especially near the close of the season. It will be observed that a discrepancy in the remaining mileage of wall benches is here apparent. Similar inconsistencies will be noticed in the accounts of subsequent years, which are taken from the contemporaneous reports.

The magnitude which the question of transporting freight through the state had assumed was the subject of earnest discussion by the Governor in his message covering this period, and indeed by the State Engineer and other canal officials. The impera-

tive demands, by outside interests, to the General Government for better facilities for the transportation of their products to the seaboard, and the arguments, which the friends of the canal had hastened to interpose in their defense, seem to have created the official impression that the canals of the state had but narrowly escaped being placed at the mercy of foreign corporations, as competitors, by the contemplated construction of the ship canals. The immediate improvement of traffic facilities upon the Erie canal was, therefore, urged by the authorities, with the added impetus of the argument that it had become a *mesur * of self-protection. It was considered that the canals, as then constructed, were adequate to carry a traffic of four million tons each way during an average season, while so far no demand had at any time been made upon them for more than three-fourths of this amount. By the enlargement of one tier of locks to a chamber-length of two hundred and twenty feet by a width of twenty-five feet at the lower water-surface, boats of six-foot draught could be passed, carrying cargoes of five hundred tons. With an equal distribution of traffic throughout the season, the capacity would be increased to at least five million tons each way, and the cost of transportation reduced from two and sixteen hundredths to one and forty-four hundredths mills per ton-mile—based upon horse-power being used. In the opinion of the State Engineer, the probable substitution of steam-power would doubtless reduce the cost of transportation nearly fifty per cent. The surveys and estimates of 1863-4, which were considered reliable, were used as a basis for these deductions, and by certain modifications in lock masonry and construction, in the interest of economy, the total estimate for enlarging the locks was placed at about ten million dollars. This did not include the item of deepening the prism one foot, which, in view of its existing limited width, was considered as of at least doubtful utility. Neither was the sum of \$1,794,110, the amount necessary to remove the old wall benches,—a measure requisite to improve the working capacity of the canals even without lock enlargement—included in this estimate.

In order to properly appreciate the sequence of important events which followed during the next decade, it is necessary to turn our attention to another phase of the situation and to

briefly outline certain matters which not only bore upon, but controlled those events. At no subsequent period within the forty years that have since elapsed have conditions then existing been repeated, nor probably ever will be. The close of the Civil war, in 1865, brought to the people of the Empire State, in common with all the North, renewed peace and prosperity. The channels of trade opened with vigor and commerce sprang into life. Local industries and factories soon employed thousands. The shop, farm and store were thriving as in the past. People invested money in all kinds of business enterprises. The new industrial life demanded increased facilities for transportation. The State was entering upon an era of prosperity, unknown in the past and scarcely dreamed for the future. Wages were high, work was plentiful and money was expended liberally on improvements, both public and private, and, as a logical sequence, not always with the careful supervision which should have been given. With the alternating changes of both State and municipal control in New York, political tension ran high. Under these favorable circumstances it was not strange that numerous contractors and officials should have embraced the opportunity and overstepped the bounds of integrity.⁹

These conditions were neither a matter of administrations nor of party, but rather of private greed and cupidity. It was becoming a matter of general though unsubstantiated belief that money was being improperly used, and the attention of the Legislature of 1867 was early drawn to the existing condition. In March of that year, by concurrent resolution,¹⁰ a joint committee, composed of Senators Stanford, Gibson and H. C. Murphy, and Assemblymen Bristol, H. Smith, Gridley, Millsbaugh and W. S. Clark, was appointed to inquire into the management of any of the canals of the State and of any department thereof, to investigate the conduct of any person then or theretofore officially connected with the canals, and also of the contracting board, to inquire into the awards made for canal damages and canal breaks, and also to investigate the nonperformance of contracts. The resolution was offered in the Senate on January 30. The public press, without regard to party affiliations, editorially upheld the

⁹Anderson and Flick's *History of New York State*, p. 246.

¹⁰*Session Laws*, 1867, p. 2495.

necessity of an investigation. On January 27 the *Albany Argus* editorially said that the superintendent and contract systems had after trial both proved failures; that boatmen claimed that their rights were not protected. Charges of favoritism in letting contracts were made and the canal "ring" was denounced. It was alleged that matters growing out of the recent war had absorbed public attention, with this result.

On January 31 the *Albany Evening Journal* editorially said that immense, long-continued and wide-reaching frauds were matters of general report and belief. It advocated taking the canals out of the hands of those responsible for the frauds, saying that everyone was aware of the condition of things, though no one had, so far, been able to trace the matter to its source.

The report¹¹ of the investigating committee bears the date of January 22, 1868. It stated that from the testimony taken it was shown that gross frauds had been for a long time perpetrated by various individuals and combinations of men against the State, in the management of the canals; that the abuses thus practiced involved those engaged in permanent construction work and in superintendence and repairs, as well as the trusted functionaries of the State. In regard to the contracting system, it was learned that at the opening of proposals for repair contracts on December 28, 1866, the various contractors had held an organized meeting at Stanwix Hall, Albany, at which the rights to make exclusive bids were put up and auctioned off among themselves, the amount thus realized being divided among themselves, and the successful bidder recouping himself by adding the amount, or more, to his bid, the other proposals being "dummy" bids, which were rejected for technical informalities. The contracting board was found to be guilty of corrupt collusion with the contractors, at least one of their number having had knowledge of the Stanwix Hall combination, when the contracts were made. The committee found that the loss of money to the State by frauds practiced within the preceding ten years amounted to several million dollars. Numerous relief bills had been skillfully engineered through the Legislature, by which the canal board was authorized to render excessive awards, and, in general, the committee roundly denounced the repair contract system.

¹¹*Assembly Documents, 1868, No. 32.*

In 1867 there was held a constitutional convention, which met on June 4. This is the only Convention which has ever been held under the twenty-year rule established by the Constitution of 1846. At its session the convention considered fully the subject of canals. Of its work in this respect Judge Lincoln's recent book has this to say: "It had long been apparent that reform was needed in canal administration. The system of administration had grown up from small beginnings, and from the outset extraordinary powers had been conferred on the canal commissioners." Speaking of Governor Seward's message, he says that as far back as 1839 the Governor had objected "to the powers exercised by the commissioners. . . . Experience had justified Governor Seward's criticisms, . . . and the conviction in the minds of experienced statesmen that a remedy was needed had become so strong in 1867 that a change of canal administration was expected as a matter of course, and there was little difference of opinion in the Convention on this subject, except as to the method by which this change should be effected and the kind of administration to be substituted."¹²

The work of the Convention, except that relating to the reconstruction of the judiciary system, which was its crowning feature, was swept away by the failure of the people to ratify the proposed Constitution, when it was referred to them at the November election in 1869. Judge Lincoln considers that this action was largely instrumental in causing the formation of the legislative Constitutional Commission of 1872, which will be referred to later. A brief synopsis of the changes that the Convention proposed in relation to canal administration may clarify our view of the situation at that time, inasmuch as it shows how radical were the measures, which were deemed necessary by the delegates. The Constitution proposed to abolish the canal board, the contracting board and the offices of canal commissioner, canal appraiser and in effect also that of State Engineer, no provision being made for his election among the State officers; to vest all canal administration, except financial, in a superintendent of public works; to make the comptroller, treasurer and attorney-general the commissioners of the canal fund, and to create a court of claims and a solicitor of claims. Provision was also

¹² *Constitutional History of New York*, Vol. II., pp. 354-355.

made for paying the canal debt and for not rejecting any bid for informality until the bidder had been given an opportunity to correct his error. The Convention considered the subject of canal enlargement, but without approval. The purpose of the delegates seems to have been an endeavor to concentrate authority and responsibility in canal management. The rejection of the Constitution may indicate that the people were not in accord with so sweeping a change, and that their position toward canal affairs influenced the final result. However, several of the recommendations, but in a modified form, were later made a part of the Constitution by independent amendments.

Much complaint was made in 1867 concerning the extreme scarcity of water. The De Ruyter reservoir had proved entirely inadequate to supply the needs of the long level during dry seasons or during the plethora of traffic in the fall months or in consequence of breaks. Oneida and Cowassalon creeks were considered available for reservoirs, and Fish and Oriskany creeks could be utilized as feeders at moderate cost. It was suggested that the plan of pumping water from Oneida lake into the canals be also examined. The commissioner of the middle division made a special report concerning the scarcity of water. Insufficient water at Syracuse in the long level delayed lockages and impeded navigation; at no time was there water enough to permit lockages to the full capacity of one hundred and eighty boats per day. The Jordan level could be relieved from Oswasco lake. On the western division the supply from Lake Erie was not enough at times.

Three plans were proposed to obviate the delays in lockages at the Port Byron and Syracuse locks—those having an upward lift to the east—as follows: first, to restrict the model and tonnage of boats, as the trouble was mostly with the heavy, blunt-nosed, western grain boats, built to the full lock capacity and being unable, except slowly, to get the water behind them in the restricted lock-chamber; second, the use of local steam-power to aid in hauling them through; and third, the addition of another lock at each of these troublesome points.

Tests were made during the year 1867 at lock No. 30—a double lock of ten and a half feet lift—to determine the time required for lockage. In the trial 194 boats were locked; the shortest

time was three minutes; the longest 11.5 minutes; the average time was 5.12 minutes. With double locks, both in action, this would pass 562 boats in twenty-four hours. Increasing the average time to ten minutes would mean 288 boats per day. As the tonnage of down boats was from 210 to 240 tons, and of up boats from 50 to 100 tons, the average would be 150 tons, which would give 43,200 tons per day, and 9,072,000 tons for a season of 210 days.¹³

The dilapidated condition of the lateral canals (except the Black River canal) was becoming a subject of serious alarm. As all were exempted from sale or lease by constitutional prohibition, the State was under obligations to preserve their usefulness, yet none of them were in good navigable condition, and all were interrupted by structural decay, lack of water, landslides and other troubles, resulting from the want of systematic and needed repairs.

State Engineer Goodsell, reviewing the situation in 1867, strongly advocated the necessity of a revision of the existing system of construction and supervision. Conflicting statutes led to interferences with the commissioner's department. The repairs and maintenance of the canals should, in his opinion, be placed under the supervision of the Engineer's department, which should originate plans and detailed bills, supervise construction and make final estimates for payment by the commissioner. Necessary funds for defraying travel and expense should, of course, be allowed. An exclusive canal system of free telegraph lines was also recommended between collectors' offices in order to secure prompt knowledge of conditions and prepare to meet them.

The season of navigation in 1867 opened on May 6 and closed December 20, a period of two hundred and twenty-nine days. There were registered five hundred and twenty boats during the season, as against four hundred and twenty-five during the year 1866. The total tonnage carried by canal was 5,688,325, valued at \$278,956,712. The canal revenues were \$4,050,357.79 and the expenses of repair and maintenance were \$1,220,192.65. The canal debt was reduced to \$15,722,900, bearing \$910,645 interest annually, from which might be deducted sinking-fund balances

¹³*Assembly Documents*, 1870, No. 4, p. 119.

amounting to \$3,214,940.10. During the year there had also been a redemption and purchases of unmatured stock to the extent of \$2,497,000.

In 1868 navigation on the canals opened May 4 and closed December 7, an average period of two hundred and seventeen days. The tons of total movement during the year were 6,442,225, valued at \$305,301,920. The receipts were \$4,477,546.17. Ordinary repairs and collections were \$1,184,245.04. The canal debt was \$14,249,800, including the balance of the debt of 1846, which was paid later in the year. Against this debt there were sinking-fund balances amounting to \$4,017,232.43. The revenues had increased by nearly half a million. The balance of the canal debt of 1846, which amounted to \$2,240,860 on the thirtieth of September, was paid during the year. Governor Hoffman said in his annual message to the Legislature of 1869: "It affords me great pleasure to congratulate the Legislature and the people of the State upon the fact that the surplus revenues of the canals for the past fiscal year have been sufficient to pay the balance of the canal debt of 1846, satisfy the other requirements of the Constitution, and contribute over a hundred thousand dollars 'to defray the necessary expenses of the government.'"¹⁴ The extinguishment of this debt liberated the canal revenues from the necessity of an annual appropriation of \$1,700,000 and enabled the Legislature to make immediate appropriations for the payment of the general fund debts and deficiency loans.

During the year a new method of steam propulsion was tested and its results were favorably commented upon by the department. Unlike the methods by towing propellers, screw and side-wheel paddle propellers and endless chains, which had already been tried, this plan provided for applying the power directly from the engine to an adjustable wheel under the center of the boat, which rolled along the bottom of the canal, propelling the boat by its weight and friction, upon the same principle as a locomotive driving-wheel. In case of very deep water a screw propeller was used. No unusual swell was created and it was claimed that twice the speed of horses could be obtained with less expense.

¹⁴ *Senate Documents*, 1869, No. 2, p. 14.

Also, a remedy was sought for the delay and expense of weighing cargoes, the Legislature of 1866 having made a small appropriation for the purpose. Amsden's hydrostatic scale, which had been under notice for many years, or since 1841, received a favorable report from the committee in charge and the canal board authorized its limited employment. By its use, the weights of the boat, both light and with its cargo, were ascertained by the amount of water displaced, as registered on a graduated tube placed amidships. The Engineer's department, however, was opposed to its extended use, mainly for the reason that increased opportunity for fraud was presented by reason of its not being under the control of sworn officials of the State.

The final maps and surveys of the enlarged Erie canal—known as the "blue line" maps,—showing correct position of canal lands and true location of enlarged canal, were about completed during the year. These surveys had been in progress for several years, having been made as the engineers had opportunity after any portion was finished, even before the so-called completion in 1862.

In his annual report for 1868, the State Engineer again urged the removal of the old "bench walls"—preferably termed benches—upon the Erie canal, and also the immediate construction of the Fish creek feeder to supply additional water to the long summit level. These improvements had been repeatedly urged for more than eight years. His report showed that eighty miles of these benches still existed (which, incidentally, was several miles more than had been previously reported) and the estimated cost of their removal was given as two thousand dollars per mile, or \$160,000. The estimated cost of the Fish creek feeder, including land damages,—based upon a length of eleven miles, and a section fifteen feet wide on bottom, thirty-one feet at surface, with four feet depth of water, capable of delivering seventy-five hundred cubic feet of water per minute at the canal near Rome,—was \$335,000. The doubling of the remainder of the locks on the western division was also urged. The most serious objection to a single lock was deemed to be its liability to accident, in which case the whole traffic of the canals was interrupted until it could be repaired. The cost of this doubling

was estimated at \$425,000. Now that more of the canal revenues were to be made available by their release from certain constitutional obligations by the extinguishment of the debt of 1846, these much-needed improvements were most strongly urged.¹⁵ This report again roundly condemned the contract repair system. The project of lock enlargement seems to have remained quiescent for the time being.

The Legislature of 1869 seemed inclined to authorize more extensive improvements than had been undertaken since 1862. In reply to a resolution of inquiry, the canal board submitted to the Assembly, on February 3, an estimate of the cost of completing the Erie, Oswego and Champlain canals upon the plan of the recent enlargement,—doubling the locks and removing “bench walls.” The Erie was estimated by the engineers to cost \$2,418,620 to complete, and the three named, \$2,910,220. The work would require three years.¹⁶ The Legislature was also importuned by various commercial bodies to take some action looking toward the further improvement of the canals. The Assembly committee on canals, on April 23, reported an amendment to the Constitution, authorizing the canal fund commissioners to borrow ten million dollars to improve the canals and asking for the appointment of a special expert commission to examine into their condition and to report the most feasible and economical plan for their improvement.¹⁷ Although the Legislature failed to sanction this amendment, it made large provision for numerous improvements. By chapter 877, a three-fourths-mill tax was laid for the purpose of extraordinary repairs and new work on the canals, including the removal of wall benches, strengthening of banks, building of slope and vertical walls and doubling of locks on the western division. The construction of Fish creek feeder was also authorized by this law, which appropriated \$100,000 therefor. Its necessity and availability as the means of an additional supply of water for the eastern end of the long level was conceded by all who were conversant with the situation. The estimated cost was then placed at \$693,250. It was planned for a length of thirteen and three

¹⁵*Assembly Documents*, 1869, No. 11, pp. 20-23.

¹⁶*Assembly Documents*, 1869, No. 59.

¹⁷*Assembly Documents*, 1869, No. 193.

tenths miles from the west branch of Fish creek at McConnellsville to a point on the canal three miles west of Rome. It was to be sixteen feet wide on bottom, four feet in depth, slopes two to one, surface thirty-two feet, with a descent of six inches to the mile and to deliver about eight thousand cubic feet of water per minute. However, this feeder was never constructed. After considering the project more carefully for several years, it was finally discarded, chiefly lest the diversion of water should involve the State in extended suits for damages.

In response to the demands of those who urged that cheaper tolls meant increased business for the canals, concurrent resolutions were also adopted, reducing by about fifty per cent the tolls on iron castings and a score of heavy commodities. The experiment was later admitted to be a failure. The freights billed through to Chicago and the West by way of the lakes were placed on board lake steamers, which were either owned or subsidized by the railroads, and the lake rates were promptly raised from two to four dollars per ton, thus nullifying the effect of the change in tolls.

The canal opened for navigation on May 6, 1869, and closed December 10, a period of two hundred and eighteen days. The canal revenues for the fiscal year were \$4,161,280.10, while the expenses were \$1,278,507.52. The net receipts were applied in two parts, thus: to the sinking fund under section two of the Constitution, \$1,500,000; and the remainder, \$1,382,772.58, to the sinking fund under section three. The canal debt was \$12,564,780, and if the various sinking-fund balances were applied, the net debt would be reduced to \$9,351,758.65, a net reduction for the year of \$880,968.92. There were then in service 6,870 boats, as stated by the auditor. The canals were overstocked with boats. If all were employed, their tonnage would exceed the capacity of the canals by three million tons. This condition made the business of the carriers unremunerative. According to the auditor, the business of the year exhibited a falling off of \$410,528.55, attributable mainly to a late opening of navigation, a short corn crop, a short supply of coal, unremunerative markets for wheat and flour and a reduction of tolls. The tons of total movement were 5,859,080, of the value of \$249,281,284.

In their subsequent annual reports covering the period of 1869, both the Governor and the auditor recommended further reduction of tolls; the State Engineer's department advocated the use of steam-dredges for the purpose of bottoming out the prism. The contract repair system was largely blamed for the accumulated deposits of mud and silt in the bottom. The general change from wood to iron bridges, which had of late become the policy of the canal authorities, was considered as an important factor in the aggregate of expenditures.

By this time the flood of objections to the contract system of repairs had reached its culminating point. By the terms of chapter 55, Laws of 1870, the contracting board and the system of canal repairs by contract were abolished, except that outstanding contracts were not invalidated. Contractors might, at their option, surrender their existing contracts, which the canal board must cancel, or the board itself might, upon the recommendation of the commissioners, annul any existing contract. The canal board was to settle with contractors so surrendering, also to determine the future method or system of repairing the canals, appoint canal patrolmen and make rules to carry out the provisions of the act. By its terms, the canal commissioners were specifically exempted from its operations and were left with their full power and control otherwise provided by law.

By legislative enactments, various methods of steam propulsion were authorized during the year (1870). Chapter 576 granted to Addison M. Farwell and associates the exclusive right to introduce and operate, for towing purposes, a system of chains or cables, laid upon the bottom of the canal. This was known as the European or Belgian system, and had been successfully operated on various foreign canals. But at the close of the season, the commissioners asserted that no action seemed to have been taken by the beneficiaries of these concessions. Chapter 655 authorized Norman W. Kingsley and Charles H. Gardner to construct and operate, under their patents, a system of chains, cables or rails suspended over the canal. Another form of detached boat-scale (Reim's), for ascertaining the weight of boats, was authorized by chapter 656. All of these improvements were to be under the supervision of the canal board. Some experi-

ments in steam propulsion, however, were made by private enterprise during the year, the canal-boat Geo. S. Barnard, capacity two hundred tons, propelled by steam, making an experimental trip up the Hudson river and through the Erie canal to Schenectady and return. The results of this trial proved that steam could be applied to ordinary canal-boats to propel them three miles an hour, or twice the speed of the loaded boats propelled by horses, without any injurious action on the canal banks. The State Engineer thought that the direct solution of the question of the practicability and economy of navigating the canals by steam-power could be more speedily and satisfactorily ascertained by placing the matter in the hands of the canal board. In his annual report for 1870, he reiterated his recommendation of the previous year, in asking that an appropriation of not less than \$20,000 be made and that authority be given the canal board to have such experiments and examinations made as would determine the best methods of applying steam to canal navigation. Heretofore the experiments had been entirely at the risk and expense of the inventors, most of whom had not been fully acquainted with the principles involved in the navigation of contracted or artificial channels. As will be noted a little later, this request brought a response from the next Legislature, which offered a prize that finally resulted in the introduction of successful steam propulsion on the canals.

Chapter 767 authorized the deepening and improving of the canal at Black Rock harbor, Buffalo, to the extent of \$80,000. The surface width from Buffalo to the Buffalo and Niagara Falls railroad bridge was one hundred and fifty feet; thence to below Ferry street there was only a restricted channel of seventy feet, with a broad channel between that and the Niagara river to the lower end of the harbor, where several large mills were located, using water from the harbor. Without great care water was liable to be used also directly from the canal. Moreover, most of the water required to maintain the canal from Buffalo east to Montezuma, nearly one hundred and fifty miles, passed through this seventy-foot channel, thus creating a strong current, which the loaded, west-bound boats could stem with difficulty. It was proposed to set back the dividing bank, giving a channel

one hundred and fifty feet wide, at an expense of three hundred and fifty thousand dollars.

Tumble-gates, invented by George Heath, were put into locks Nos. 44 and 45, and Mr. Heath was also authorized to expend \$4,000 in experiments for utilizing the feed-water, passed through the culvert between the locks, by appliances for operating the lower gates and for aiding boats to draw in and out in shorter time. The experiment was made at lock No. 37, at Little Falls. Speaking of the tumble-gates, the State Engineer said that, as the capacity of a canal was measured by its facilities for lockage and as the new gates, after having been tested for the past two or three years, had proved so successful, their general introduction, at least upon the Erie canal, was desirable. The details of their construction have been referred to already. These experiments marked the beginning of the machinery that was later installed and has been used so successfully ever since. The power utilized had formerly gone to waste.

Navigation opened May 10, 1870, and closed December 8, remaining open two hundred and thirteen days. The tons of total movement on the canals for the season were 6,173,769, of the value of \$231,836,176. The revenues were \$3,107,138.90 and the expenses were given as \$1,945,635.92. The outstanding canal debt, on September 30, was \$12,564,780 and the sinking-fund balances to meet it were \$2,149,884.61. The canal auditor called attention to the recent prevailing practice of providing for all extraordinary expenditures in a single bill, instead of separate local bills, as had been the custom previously. The insertion of items of appropriation for local purposes secured the mutual support of interested legislators and facilitated its passage. During that year, such appropriations for improvements, new work and extraordinary repairs had amounted to \$4,168,151.21, a sum nearly equal to the entire cost of the original Erie canal.

In his message covering this period, the Governor said that there had been a falling off of revenue since the preceding season, which, however, was not serious. It was not all due to low tolls. The competitive freights were also low. New York produced 6,000,000 bushels of wheat and consumed 21,000,000 bushels, besides corn, oats, rye and barley. A part of the policy

of 1870 had been to put the canals in thorough order. After many years of neglect they had become obstructed and dilapidated. It was to be hoped that in the following year revenues would be larger and expenditures less. The average round trip had been shortened four days. Experiments in steam navigation, he thought, should be fostered.¹⁸

At the close of the season there appeared to have been still remaining some thirty-six miles of old wall benches in the eastern division; the Jordan, Syracuse and long levels still contained some uncompleted sections, and between Lyons and Newark only about one-third of this form of improvement had been accomplished. It was alleged that wherever they had been removed at least twenty per cent had been added to the efficiency of the canal.

By the State Engineer, the division engineers, forwarders, boatmen and others whose interest brought them into contact with the canal, the change in method of repair under the new system, resulting in comparative freedom from breaks and other interruptions to navigation, was considered a marked improvement, after a season's trial of the new plan. The auditor, however, deprecated the increased cost of maintenance and repairs. In view of the neglected condition of the canals under the old system, however, it may be said that additional expense for a few years was to be expected.

The question of accelerated speed, and consequently cheaper transportation, was at this period given a large share of attention by those interested in the success of the canals. Steam voyages had been made, and with success, but so far at a cost which was prohibitive in comparison with the expense of animal towage. The Belgian system, the trial of which had been authorized by legislative concession in 1870, was exhibited on a section of the canal between Albany and West Troy near the close of the season of 1871, but its results were not considered entirely satisfactory. The suggestions of the State Engineer in regard to placing in the hands of canal officials the subject of introducing steam, as a motor power, upon the principal canals of the State, were to a certain extent carried out by legislative enact-

¹⁸*Assembly Documents*, 1871, No. 2, Governor's Annual Message.

ment. Chapter 868, Laws of 1871, provided for a commission of ten eminent and practical men to test and examine inventions and "devices" submitted to them for propulsion other than by animal power. George B. McClellan, Horatio Seymour, Erastus C. Prosser, David Dow, George Geddes, Van R. Richmond, Willis S. Nelson, George W. Chapman, William W. Wright and John D. Fay were named as such commissioners. The tests and experiments were to continue throughout 1871 and also 1872, if necessary. They were to be conducted at the expense of the parties offering devices and were to be made with boats carrying two hundred tons of cargo and making an average speed of at least three miles per hour. Because the Belgian system had been otherwise provided for, that system and all other systems of bank propulsion were excluded. The commissioners were empowered, at their discretion, to make certificates of comparative degrees of perfection as to methods employed and results attained. Certificate number one, if the only one issued, on presentation to the Comptroller, would draw a prize of \$50,000. If two certificates were issued, they would draw, respectively, \$35,000 and \$15,000. If three were issued, then \$30,000, \$15,000 and \$5,000, respectively. The commissioners might also grant a further certificate of successful operation and probable general adoption, which certificate would draw a further sum of \$50,000, if only one was issued. If more, then the division was to be in the same proportions as in the case of the first-named certificates.

The commissioners organized at Albany in July, 1871, by electing Hon. Van R. Richmond as chairman; David M. Greene, of Troy, was appointed engineer of the commission. Horatio Seymour having declined to serve, the Governor appointed Daniel Crouse, of Utica, to fill the vacancy. To aid inventors, the commission, by resolution, informed them that the chief desideratum was to establish the economy of steam or other motor power as compared with animal power and that former experiments had not failed because of the injury done to banks by reason of the swell from boats or wheels, the commissioners judging that no inherent difficulty was to be expected from that source, with boats carrying two hundred tons of cargo at three miles an hour. The steamer A. H. Dawson was the only

competing boat that made its appearance on the canal during the season of 1871. While an average speed of three miles per hour was not made, that speed was made at various points.

Other systems of propulsion were also to be given a trial. By chapter 911, Laws of 1871, James Richmond and William S. Farnell were authorized to introduce the "American" system of cable towage, under the usual non-competitive conditions. By chapter 903, of the same year, the Kingsley-Gardner concession was given three years to introduce their system, or forfeit their rights and privileges.

The Assembly made inquiry on February 6, 1871, as to the necessity and expediency of enlarging certain locks on the western division to accommodate boats of two hundred feet in length by twenty-five feet in width. The canal board promptly reported adversely to such enlargement, upon the ground that the canal then had twice the capacity to meet the demands of transportation; that, if the locks on the western division were enlarged, the locks on the entire canal must be similarly enlarged; and that such enlargement would cost fifty million dollars. Under an Assembly resolution of February 10, the canal board reported that seven different kinds of boat scales had been under consideration. They recommended "Reim's Champion Scales" for use if desired, but did not advise the discontinuance of the use of weigh-locks at that time.

The machinery at lock No. 37 proved quite successful. The feed-water was applied to a water-wheel located in a well at the head of the lock. It readily furnished power to open and close both the tumble-gate and the lower miter-gates and to draw boats into and out of the lock with marked ease and rapidity. By the ordinary method, with miter-gates, Mr. Heath computed that it would require 29,631 cubic feet of water for a lockage; using the tumble-gate and the other devices, 10,815 cubic feet, or a saving of about two-thirds of the water; and in lock-tenders' wages for a season at one lock, the saving was estimated to be \$450.

In the month of August a scarcity of water was felt from the increased traffic and consequent loss of water by lockage. Oriskany creek was temporarily diverted as a feeder and by Oc-

tober was in use, furnishing some 4,500 cubic feet per minute. The diversion cost about \$32,000. Later the work was permanently appropriated by the State. The feeder was fifty-three miles long; the dam, two hundred and fourteen feet long and eight feet high; the prism, twenty-six feet at water-line, fourteen feet at bottom and four feet deep. Complaints of a scarcity of water were heard at other points along the canal.

Governor Hoffman, speaking of the year 1871, said that the surplus revenues of the canal during that year were nearly double those of the previous year, while the expenditures were materially reduced. To the sinking fund for the payment of the canal debt was carried \$981,588.68. The Comptroller's report, covering the same period, strongly advocated still lower tolls. By the canal auditor's financial statement, the receipts for the fiscal year were \$2,842,549.94 and the expenses, \$1,658,617.25, the interest-bearing canal debt being then reduced to \$11,966,420. The tons of total movement were 6,467,888, valued at \$238,767,691. Navigation opened April 24 and closed December 1, two hundred and twenty days. One hundred and ninety-four boats were registered. About thirty-six miles of old wall benches still remained on the eastern division at the close of the season.

So much complaint had been made of the amount and manner of expenditures upon the canals, with adverse criticism of their management, that on March 11, 1872, the canal board, by formal resolution, requested the Legislature to make a full and searching investigation into the whole question of canal management and finances, both past and present, for the purpose, as the resolution stated, of stopping extravagances and adopting an economical policy for their future management.

The Legislature, by the passage of chapter 884, provided for a Constitutional Commission of thirty-two members to consider and propose such amendments to the State Constitution at the legislative session of 1873, as they should deem necessary. This was rendered necessary, as we have previously seen, by the failure of the people to ratify the Constitution provided by the Convention of 1867.

By reason of low water in Lake Erie at times during the season of 1872, boats were compelled to go by way of Niagara river

to Tonawanda, taking the canal there. This was not only a dangerous practice, but resulted in a substantial loss of tolls between Buffalo and Tonawanda. The extensive improvements then in progress at Black Rock harbor were expected to obviate this difficulty.

At the close of the season the State Engineer reported the following condition of old wall benches: in the eastern division, under contract for removal, tow-path side, 27.87 miles, and berme side, 31.23 miles; not under contract, tow-path side, 8.83 miles, berme side, 5.06 miles; in the middle division, tow-path side, 6.85 miles, berme side, 13.01 miles, this being mostly on the troublesome Jordan level, which was charged with 4.75 miles on the tow-path side and 11 miles on the berme side. The western division had but 0.91 mile, which was under contract.

The canals were open for navigation only two hundred and two days, or from May 13 to December 1, 1872. The tons of total movement for the year were 6,673,370, of the value of \$220,913,321—the maximum tonnage of the canals thus far throughout their existence. The revenues for the fiscal year were \$3,078,247.96, and the payments for ordinary repairs and collections were \$1,875,676.61. The canal debt, on September 30, amounted to \$11,396,680, and the aggregate sinking funds for its payment were \$1,449,978.15, leaving a balance of \$9,946,701.85 unprovided for.

During this season the Belgian or European system of cable towage made further progress, the company having laid a single cable from Buffalo to Lockport. More elaborate and extended tests of steam towage were also made in the contest for the prize offered by the State. Twelve steamers were placed upon the canal during the season, but only three succeeded in making the three round trips between New York and Buffalo, required by the rules of the commission. The first, the William Baxter, left West Troy on her first trip west, on August 29, 1872, and ended her third round trip, at the same point, on November 14. Her mean speed was 3.29 miles per hour and the average coal consumption 31.04 pounds per boat-mile. The second steamer was the William Newman,—mean speed, 2.727 miles per hour. The third steamer was the Port Byron,—mean speed, 2.685 miles per hour. The late date at which the preliminary trial trips were

completed prevented the commission from carrying out the further tests which were deemed necessary in order to warrant a decision as to whether any of the boats had fully complied with the requirements of the law. The commission, therefore, at a meeting in February, 1873, resolved to ask the Legislature for a continuance of the offer of rewards, and an extension of one year in the time for competition. The second annual report of the commission on steam towage was made to the Legislature on February 24, 1873, and is published as *Senate Document No. 71*, of that year.

The Constitutional Commission presented its report¹⁹ to the Legislature on March 25, 1873. The committee on canals presented various amendments to articles five and seven of the existing Constitution. A new system of management was proposed—by the abolition of the office of canal commissioner and the substitution of a superintendent of public works, with enlarged powers and direct responsibility. Extra compensation to contractors, which had been the cause of much criticism, was forbidden by another amendment, and by another the constitutional prohibition to sell or dispose of certain canals was removed, the exceptions being the Erie, Oswego, Champlain and Cayuga and Seneca canals, and the expenditures for collections, superintendence, ordinary and extraordinary repairs on these canals were limited to their gross receipts for the previous year. The proposed amendments relating to the canal commissioners and superintendent of public works were approved by the Legislature of 1873, but were omitted in 1874. A few years later, however, these recommendations found their way into the Constitution. The other amendments were approved by the Legislature of 1873 and 1874 and were adopted by the people at the November election, 1874. By some legislative method, which subsequent inquiry seemingly failed to disclose, the Black River canal was included in the concurrent resolutions of 1873, among those to be retained as "constitutional canals." An opinion²⁰ was obtained from the Attorney-General, to the effect that as it appeared there without any evidence to impeach the correctness of the resolution, it stood on the same footing as the Erie,

¹⁹ *Senate Documents*, 1873, No. 70.

²⁰ *Assembly Documents*, 1874, No. 46.

Oswego and Champlain canals. In 1874, however, the proposed amendment was approved by the Legislature without the insertion of the Black River canal, and went before the people in that form. The matter of abandoning the lateral canals will be carefully discussed in a chapter devoted to that subject and need not be dwelt upon at present.

The Legislature of 1873 also "assented" to the proposed action of the canal board in reducing the toll rates, not to exceed fifty per cent below the toll sheet of 1852, with liberty to change the same at the discretion of the board, during the ensuing season of navigation. A committee of the United States Senate was in session during the year, considering the subject of "Transportation Routes to the Seaboard." By concurrent resolution, a joint committee of five Senators and nine Assemblymen was appointed to represent the interests of New York State before this committee.

Navigation upon the canals opened May 15, 1873, the opening being retarded to enable the completion of certain repairs. The official closing was on December 5, a period of two hundred and five days, which was still further shortened, as navigation practically ceased after November 20, over a thousand boats being frozen in, very few of which reached tide-water. The season was one of the shortest on record, yet the receipts for tolls were nearly as much as in the preceding year. The tons of total movement for the season were 6,364,782, valued at \$191,715,500. The number of boats registered, old and new, was 433. The receipts from tolls for the season were \$2,976,718. The revenues for the fiscal year ending September 30, were \$3,082,452.04, of which toll receipts represented \$3,021,603.67 and the expenses for ordinary repairs and collections were \$1,459,165.24, leaving a surplus of \$1,623,286.80. The total canal debt at this date was \$11,352,880, with sinking-fund balances of \$1,530,241.21, leaving a net indebtedness of \$10,256,655.54, which includes sinking-fund deficiency under article 7, section 3, of \$434,016.75.

The increasing disposition to build boats of the utmost size that would pass in the lock-chambers resulted in an increased detention in lockages, by reason of the inability of boats of such dimensions to force their way quickly through the restricted

passage. This was especially true in the case of heavily laden boats locking upward to the east, as at locks Nos. 47, 48 and 49. The experiment of widening the lock-chamber to twenty feet had been tried at these locks with the natural result that the time of lockage had been reduced by about one-half. Commissioner R. W. Stroud, of the middle division, therefore urged that the two remaining Erie locks having an upward lift eastward should be similarly widened and tumble-gates introduced, the estimate cost of which improvement he placed at \$70,000.

Prior to 1862, it had been the legislative custom to provide for new work, including enlargement, not connected with ordinary repairs, by special appropriations for specific locations and purposes. Chapter 169, of that year, which declared the first improvement completed, compelled the discontinuance of this plan, and thereafter work of this character had been termed extraordinary repairs. In reply to certain criticisms, which had appeared in the public journals, the State Engineer explained the authority of various officials over the funds for this work, saying that for the laws directing the work the Legislature was responsible, for the approval of plans and estimates the State Engineer was accountable, and with their adoption the canal board was charged; also that the division and resident engineers determined the character of the work, and the canal commissioners were responsible only for issuing drafts in conformity with their estimates. The funds for ordinary repairs, however, were entirely under the control of the canal commissioners.²¹

The Legislature having extended the term of the steam towage commissioners for another year, six boats were brought to their attention during 1873, and public trial was held between Syracuse and Utica, of which due notice was given. Of the performances of these boats, that of the steamer William Baxter was conspicuous, not only for the speed attained, but for the extraordinarily low rate of coal consumed—only 14.82 $\frac{1}{2}$ tons to mile. By reason of certain difficulties in complying with obstringent provisions of the law authorizing the experiment as it appears, the commissioners finally submitted the whole ~~bestness~~ awards to the Legislature of 1874, with a draft of a proposed law

²¹*Assembly Documents*, 1874, No. 24, p. 23.

that would do justice to the several competitors. The Legislature, accordingly, directed the Comptroller to pay to William Baxter, upon the presentation of the certificate of the State Engineer, the sum of \$35,000, if he placed upon the canal during 1874 seven steamboats in all respects like his boat the City of New York; to David P. Dobbins, in like manner, the sum of \$15,000, if he placed upon the canal three boats like his William Newman, and to Theodore Davis the sum of \$5,000, if he placed upon the canal one boat like his Central City.

The Otisco lake reservoir was completed during 1873, and its full capacity realized during the season of navigation. This was an important addition to the water-supply of the Jordan level, the water being taken into the canal through the Nine Mile creek feeder. The capacity of this reservoir was 784,000,000 cubic feet. Few extraordinary repairs were made on the canal during the year, because of the lack of funds. Four locks on the western division were doubled. The commissioner of the middle division reported that portions of the Erie were greatly damaged by devastating floods.

During the session of 1874 various legislative inquiries were made concerning existing conditions on the canals. In reply to one of these questions, made January 7, the State Engineer furnished an estimate of the remaining wall benches and the cost to remove them. For the eastern division, there were upon the tow-path side 33.63 miles and upon the berme side 32.13 miles. These would cost \$645,948 to remove. Of these, there were 11.94 miles of tow-path and 3.62 miles of berme benches under contract for removal. Deducting these there still remained 21.69 miles of tow-path and 28.51 of berme benches, for the removal of which \$485,140 would be required. In the middle division there also remained 1.29 miles of tow-path and 14.38 miles of berme benches, the estimate for which was \$226,000.

leaving mileage to be removed was computed at 65.87 and its ing-fund removal, \$711,140. Replying on February 4, to an in-

The increase in the cost and revenues of feeders and dams, the canal that would make the remarkable statement that the canal feeders and dams, from 1846 to date, had cost the State \$1,600,599.81, and that the amount received for water rentals for this period

of about twenty-seven years was only \$59,421.60, or a little over \$2,000 a year.

As previously stated, the Legislature of 1874 omitted to approve the constitutional amendments relating to the abolition of the office of canal commissioner and the appointment of a superintendent of public works, but the amendments providing that no extra compensation should be allowed to any contractor, and forever prohibiting the disposal of the Erie, Champlain, Oswego and Cayuga and Seneca canals, and permitting the sale of the others, by inference, and also limiting the expenditures for repairs in any one year to the gross receipts for the previous year, were approved and, at the following November election, were ratified by the people by a substantial majority, to become effective on January 1, 1875.

The State Engineer, at about this time, called attention to the fact that as yet no really practical tests had been made to ascertain the tractive force required for moving boats under various conditions of width and depth of prism, of draught, model and tonnage of boats, either singly or in trains, and of direction and velocity of current. A small appropriation of \$2,500 was suggested to cover the expense of such contemplated tests.

During the season of 1874 the Baxter Steam Canal Boat Company was organized, and operated seven boats, becoming the first organized company of its kind upon the canals. It was considered that had the offer of the State to inventors been couched in broader terms, with fewer restrictions, the results would have been better and perhaps have opened the way to utilizing the several thousand horse-drawn boats then in existence. The New York Steam Towage Company had also during 1872, as stated, laid a single cable from Buffalo to Lockport and with two special steamers had been experimenting for two years. As a result, it was claimed that a single tow, carrying 1,400 tons of freight, was drawn by this system at a rate of three miles per hour, at as low a cost as any 200-ton steamboat.

Under existing laws it had been the practice for the State Engineer to prepare the plans for work, after which the canal board authorized the letting of contracts, and subsequent pro-

ceedings were entirely within the control of the commissioners. The State Engineer, while subjected to frequent criticisms, as in the case of unbalanced bids, had no voice in the matter. In his annual report for 1874, State Engineer Sweet asserted that the law should be so changed that the incumbent of that office should be associated with, and his approval should be an essential element in, the awarding of contracts. In his opinion, another objectionable feature of existing laws should be remedied. The requirement that the appointment of subordinate engineers should be subject to the approval of the commissioner in charge of the work on which they were employed, frequently led to the selection of objectionable and incompetent men. It was urged that such appointments be made by the Engineer's department, which was obliged to bear the responsibility for their conduct.

In referring to the capacity of the prism at this time, the State Engineer explained that, although the Erie canal was supposed to have been completed years before and the Legislature had, in 1862, so declared it, it had been known for a long time, especially by persons engaged in canal navigation, that the enlarged prism was not throughout its entire length, seventy feet wide at its surface and seven feet deep. The deficiency in width, amounting in some places to ten or twelve feet, he could not account for. The deficiency in depth was explained by the fact that the gradual accumulation, which had been going on since the completion of the enlargement, had not been wholly removed in many places, owing to lack of time and limited means for the purpose. There existed a need of adequate data concerning the alleged deficiencies in depth and width. It was true that an approximate estimate had been given to the Legislature in February preceding, but an accurate survey of the whole line, with this end in view, was urgently needed, and an appropriation of \$10,000 was asked for to cover the expense.²²

Navigation upon the canals opened on May 5 and closed December 5, in 1874. At the close of the fiscal year the aggregate canal debt was \$10,230,430, while the sinking-fund balances were \$1,561,018.99, leaving a net indebtedness of \$8,669,411.01. The tolls for the fiscal year were \$2,921,721.74, a falling off of

²²*Assembly Documents*, 1875, No. 80, pp. 19-21.

\$99,881.93. The gross receipts were \$2,947,972.91, a decrease of \$134,479.13. The expenses for the year were \$1,469,466.83, an increase of \$10,301.59. The total tonnage for the navigable season of 1874 was 5,804,588, valued at \$196,674,322, on which the tolls were \$2,637,071. The completion of the double lock at Lyons during the winter of 1874-5 is noteworthy, as opening the entire length of the Erie canal to double locks. About seven miles of wall benches were removed on the eastern division during the season, according to the report of the canal commissioner.

Because the subject has not been introduced year by year, it must not be assumed that all causes of dissatisfaction with the system of canal management had ceased after the investigation of 1867-8. Nor had the change from the system of repairs by contract in 1870 given the expected relief. New York City was but then emerging from an era of gigantic swindling, in which men of both parties had been bought and used as tools, infamous deals had been made for corporate monopolies and courts and legislatures had been bought up and compelled to aid the schemes for plunder. With their metropolis recently freed from the grasp of William M. Tweed, the "boss" of a corrupt "ring" or "machine," the people of the state were becoming aroused by the repeated cries for general reform, including changes in canal management, to which the same term of "ring" was applied. There appeared to be no settled policy of canal management at this time. Both systems—by contract and by commissioners—had been tried and found wanting. It was a case of "many men of many minds." Advocates of either system were not slow to bitterly criticise and condemn the other.

The year 1875, though some thirty years have since elapsed, is still regarded by those familiar with the time, as one of the most memorable in the history of the canals. Samuel J. Tilden, fresh from his overthrow of Tweed, had been swept into the Governor's chair by the popular demand for reform, and early in his administration, by a special message to the Legislature, he instituted examinations into canal affairs. In his message at the opening of the Legislature he confined his attention chiefly to matters of canal policy—such questions as concerned its material needs, rather than the investigation of alleged frauds. In

this message he clearly and ably set forth his views on the canal situation. He considered the Erie canal and its connecting waterways as the "National pass of commerce" between the western states and the Atlantic coast, saying: "The Erie canal remains an important and valuable instrument of transport, not only by its direct services, but by its regulating power in competition with other methods of transportation."²³ Continuing, he said in substance that New York had maintained a broad and liberal policy toward her canals. They should not be considered solely as revenue producers, but rather should be managed for the needs of the commerce of the whole people. Cheaper tolls primarily benefited the western producer. The price of grain was fixed, even for home consumption, by the condition of the foreign markets. Natural conditions would prevent the traffic of the canal and that of lake and ocean from becoming homogeneous, and would prescribe the style of boat best fitted to its particular channel, demanding transshipment at terminals to vessels adapted to each method of transportation.

The project so often urged within the previous ten years—of enlarging the locks and other structures, without a proportionate enlargement of the waterway, was condemned by Mr. Tilden. He said: "That plan exhibits a singular union of injurious costliness and fatal parsimony. It is founded on the fallacy that the use of a large boat, without reference to its adaption to the waterway in which it is to move, would be economical."²⁴

In the Governor's opinion, to perfect the existing canal was the best policy. This done, its capacity was considered to be ample for the traffic of the time. The tolls then charged should be retained, as improvement funds. No rash changes should be made in altering gates or lengthening chambers of locks. The lateral canals were a heavy expense and for that reason the income of the Erie should be increased, by improvements, before discarding the existing income by further reduction of tolls. "What the Erie canal wants," said the Governor, "is more water in the prism." He recommended that its depth throughout be made seven feet, an honest seven feet, as he expressed it. As

²³*Assembly Documents*, 1875, No. 2, p. 18.

²⁴*Id.*, p. 20.

the first step toward this end, he advised that provision be made to enable the State Engineer to obtain an accurate survey of the Erie, including "cross-sections as often as every four rods of its length." This recommendation agreed with the suggestion of the State Engineer, as already noted. The Legislature did not respond to this request till the following year.

The Governor also suggested a special commission to examine and advise as to which of the laterals it would be best to dispose of, and which should be retained as feeders, but the Legislature saw fit to charge the State Engineer and the canal commissioners with this duty.

On February 9, 1875, the chamber of commerce of the City of New York presented formal resolutions²⁵ to the Senate as to the vital necessity of bottoming out the trunk canal to the depth of seven feet, as recommended in the Governor's message, and asking for a survey for this purpose, to be made with the least possible delay. The resolutions further stated that any ulterior questions of enlargement of structures might safely be postponed until the required depth was obtained. Honest and economical management should be secured, and the Governor's suggestions concerning disposition of laterals were approved.

In both branches of the Legislature active inquiries were made of various state officials concerning canal propositions then under discussion. The quality of material used in doubling the locks on the western division having been criticised, the State Engineer made an examination by request of the Senate and reported favorably upon their condition.²⁶ *Senate Document No. 89* contains the report of the sub-committee on canals, in accordance to the directions of the Senate, concerning terminal charges upon traffic at Buffalo and New York. The report showed excessive terminal charges in New York for handling grain, amounting to nearly five cents per bushel; it declared that dock facilities in New York were insufficient, damaging canal interests; and that by a combination of insurance companies excessive rates were charged. Terminal rates for handling grain at Buffalo were found to be less than at New York, amounting

²⁵ *Senate Documents*, 1875, No. 41.

²⁶ *Senate Documents*, 1875, No. 93.

to about one and three-quarter cents per bushel, plus the scalper's charges, making the total charge at Buffalo nearly three cents per bushel. The testimony showed that grain could be efficiently handled with profit at Buffalo for one-quarter cent per bushel. The Buffalo Elevator Association was termed a trust and severely scored, and it was alleged that these combined grain charges of eight cents per bushel added to three cents canal toll were seriously crippling the commerce of the canals.

On March 19 the canal board submitted a revised toll sheet for the coming season, making sweeping reductions; among them one-third the tolls on grain and about the same on lumber. This reduction met with legislative approval. The Legislature also passed the constitutional amendment changing the control of the canals from commissioners to a Superintendent of Public Works, and recommended the same to the Legislature of 1876, thus forwarding the proposal of the Constitutional Commission of 1872, which had failed to come before the people with the other amendments in 1874, because the Legislature of that year had failed to approve the measure.

On March 19 Governor Tilden submitted to the Legislature a special message relating to the canals, in response, as he asserted, to numerous demands of forwarders, boatmen and others for a further reduction of tolls. The message, however, did not deal exclusively with the question of tolls. It strongly urged increased economy in expenditures; it called attention to the prevalent methods of letting contracts, and to the evil of unbalanced bids and "continued"²⁷ contracts, and advocated stricter methods of enforcing official accountability; it recommended a return to the plan of awarding contracts through the canal board; it deprecated the practice of the canal commissioners in ceasing to act as a board and in administering the affairs of the canal, each in his separate division, as if he were an independent authority; it suggested the creation of an inspector of public works, and also of a paymaster, accountable to the auditor; and it advocated an enlarged control of the State En-

²⁷A practice of allowing the contractor to continue a piece of work, under the terms of his original contract, after the first appropriation had been expended and another secured, instead of reletting to a possible new bidder.

gineer over his subordinates. As the Governor said later, it "opened discussion" on the question of official improvidence, waste and corruption.

In response to this message, by concurrent resolution, a joint legislative committee was created, of which three were appointed by the president of the Senate and three by the Speaker of the Assembly, to investigate and examine into the question of fraud or collusion between state officers and canal contractors. The committee was composed of the following: Dan H. Cole, James M. Booth, John C. Jacobs, James Faulkner, Jr., Richard M. Sherman, Frederick W. Seward. On April 5 they organized, appointing Hon. Henry Smith and Rufus W. Peckham as counsel, and their report²⁸ was dated May 5, although by another enactment their time was subsequently extended through the legislative recess. Their chief criticism was against the practice of awarding contracts on unbalanced bids and of continuing in force original contracts, rather than reletting the work, after an insufficient appropriation had been exhausted and an additional amount obtained. In brief, the recommendations of the committee were as follows: the Legislature should make no further appropriations for "continuing" contracts; the engineering force should all be appointed by and under one responsible head; the commissioners should be forbidden to accept unbalanced bids; every contract should be for a definite amount of material and labor, and then should be closed; any continuance should be by a new letting; the canal board should be prohibited from transferring funds from one purpose to another; the engineer's estimates and quantity sheets should not be disclosed to bidders until the contract was executed, only a list of kinds of work and required materials being exhibited (a most remarkable recommendation from the standpoint of engineer or contractor); the deposits from bidders should not be so excessive as to prohibit smaller contractors from participating; and finally, legislative changes should be in the direction of increased responsibility, there being no common head of canal officers—no common interest in the joint performance of their respective duties. It was found that nearly \$400,000 had been expended on the re-

²⁸*Assembly Documents*, 1875, No. 152.

moval of wall benches in the eastern division alone, and the work was about two-thirds completed. For this the division engineers were severely criticised.

But this was not the only investigation of canal matters. A commission of four persons was authorized by concurrent resolution of the Senate and Assembly on March 26 and 31, respectively, to be appointed by the Governor, with the approval of the Senate, to especially examine into the matters embraced within the scope of the Governor's special message of March 19. These commissioners were directed to cover at least the period from 1868 to 1875, inclusive, and they might go back further if they so desired. They were instructed to report to the Governor and to the Legislature at its next session the testimony and their recommendations, and to furnish a copy of the testimony to the Attorney-General. The commissioners appointed under this resolution were John Bigelow, Daniel Magone, Jr., Alexander E. Orr and John D. Van Buren, Jr. Evidently the Governor considered that the exigencies of the occasion demanded this unusual procedure of having an investigating commission appointed by the Chief Executive, especially with a joint legislative committee named for the same purpose.

Before considering the work of this commission, it is well to observe the trend of public sentiment at this time—how, from almost a frenzy of enthusiasm for all forms of canal-building in the early days of their existence the feeling had variously fluctuated until now it had reached the point of extreme disaffection for all canals. In his special message the Governor well said: "Unfortunately the abuses now practiced against our canals and their commerce are exciting strong prejudices against the great public works rather than against the wrong-doers and the wrong-doing which tend to destroy them." It is well to remember another circumstance in connection with this investigation—that politics played a conspicuous part. Indeed, it is known that the Speaker of the Assembly at that time, Jeremiah McGuire, of the same political affiliations as the Governor, openly charged Mr. Tilden with prosecuting this investigation in order to gain political capital. This condition will be found more or less true of all canal investigations. The

temporarily dominant party has been so persistently assailed for its management of canal affairs, that the truth in these attacks can scarcely be separated from the falsehood.

The report²⁹ of this commission was presented to the Legislature on February 14, 1876, several partial reports having been rendered to the Governor during the previous summer and autumn. Upon the testimony given before the commission several canal officials were indicted, the canal auditor was suspended from office for unlawfully dealing in canal certificates, a member of the legislature was charged with bribery and legal proceedings were urged against certain contractors. The commissioners mercilessly censured the whole system of canal management, saying: "Our investigation was not long in revealing the fact that the canals have not been managed upon the principles which would govern any man in the administration of his private estate. The interests of the public have been systematically disregarded. The precautions with which the Legislature has attempted to defend this property from speculation and fraud, and secure for it faithful and efficient service, have been deliberately and persistently disregarded; while the responsibility of its agents has been so divided and distributed, as to leave the State comparatively remediless, and at the mercy of the predatory classes, who have been, if they do not continue to be, a formidable political power."³⁰

The report severely criticised the method of letting contracts, declaring that the requirement of large guarantee funds had discouraged bidders of small means and confined the work almost exclusively to large capitalists; that the acceptance of unbalanced bids had a tendency to preclude honest bidders and that the failure to enforce the forfeiture of deposits had worked to the injury of the State. The discrepancies between quantities in preliminary and final estimates were censured, as were the long established customs of computing excavation for walls and structures at a uniform slope of one on one and of allowing a price for embankment of material obtained from excavation, when it was necessarily handled twice, even if it had not been moved the specified two hundred feet. The report deprecated the

²⁹ *Senate Documents*, 1876, No. 48, parts 1 and 2.

³⁰ *Id.*, p. 6.

use of vertical instead of slope walls, declaring that the latter would have been usually as serviceable and much cheaper. It also charged that the specifications, especially in masonry work, had not been enforced, greatly to the loss of the State. The facilities offered to contractors for legislative relief were condemned. If the canal board had failed to cancel a contract which proved disadvantageous to the contractor, he had often appealed to the Legislature, which usually had allowed awards to cover his losses.

Navigation opened May 18, 1875, and was closed (by ice) November 30, the Hudson river being closed on November 29. A communication from Mr. William Baxter, concerning the progress of steam canal towing in 1875, develops the fact that with the short season of navigation between May 18 and November 25, (as given by him), and the interruptions caused by two breaks of six and sixteen days, respectively, the navigable period was reduced to one hundred and sixty-nine days. The results given by the steamboats were considered satisfactory, but better port facilities and a thorough bottoming out were asked for. The communication was embodied in the State Engineer's report for the year. According to this report, about twelve miles of wall benches were removed on the eastern division during the year, leaving 51.51 miles remaining.

The tons of total movement during the year were 4,859,858, valued at \$145,008,575. The aggregate canal debt, September 30, was \$10,086,660, and the aggregate sinking funds, \$1,448,345.51, leaving a balance unprovided for of \$8,638,314.49. The rate of interest on the canal debt was then six per cent. The canal receipts for the fiscal year were \$1,925,995.63. The expenditures for ordinary repairs and collections were \$1,414,456.94. The net revenues of the canals for this year were less than for any year since 1828, and the gross receipts were lighter than for any year since 1836. These unfavorable financial results may be attributed, in a measure, to the general depression in business, but chiefly to the ruinous competition which prevailed between the rival trunk lines.

It was with difficulty that the canal commissioner of the eastern division had been able to open the canal for navigation in the spring. The Legislature of 1874 had made a large appropria-

tion for removing wall benches, but the funds would not be available until taxes were paid in 1875. In order to gain a year's time, contracts were let and the work was being executed during the winter of 1874-5, the contractors receiving certificates in lieu of money. The publication of the Governor's canal message, the agitation of the press upon the subject, the wholesale imputation of fraud against all canal work, and especially against certificates, so impaired public confidence that the contractors were unable to dispose of their certificates to banks and capitalists, and they stopped work, after several miles of old walls had been torn out. This condition continued until within four or five weeks of the advertised time for opening the canals, when finally, after exhausting other resources, the Legislature was appealed to and furnished relief by making some of the repair fund applicable. By extraordinary efforts the work was then pushed to completion in time for the opening.

In connection with supplying the western division with water from Lake Erie, the report of the engineer of that division presents some interesting historical facts. The surveys for the first improvement of Black Rock harbor were made in 1821, and it was constructed by uniting Bird and Squaw Islands by a pier or mole extending from the latter island to the main shore below the entrance of the canal to the basin. In effect this appropriated the deep channel of the river upon the American side for canal purposes, and caused the water in the canal to stand at nearly the level of the lake and five feet above the river level opposite. This head of water was too tempting a business proposition to be allowed to remain as it was and in 1825 the commissioners leased to Henry Kennedy for mill purposes the surplus water at the lower end of Black Rock basin for \$3,100 annually. This suicidal policy, during the very year of the completion of the canal, lost to the State what has since cost millions in the attempt to recover. As it became necessary to use greater quantities of water serious difficulties arose from the velocity of the current and often from the want of water. This condition was aggravated by the mills, for it was estimated that they used more water on their wheels than would supply the canal to Montezuma—one hundred and fifty miles. The question of building an independent channel

through this harbor was then discussed, but it was finally decided to construct a partition bank from the head of the harbor to Ferry Street island, and a new wall and towing-path, with seventy feet width of water. It was later proposed to set back this wall and widen and deepen the prism, and upon these improvements a large sum of money had been expended.⁸¹

In view of the revelations of extravagance and misconduct, as shown by the reports of the investigating commission, the Governor's annual message in 1876 recommended retrenchment in canal management, a thorough scrutiny of all expenditures, and some disposition of the unprofitable laterals. It also commended the action of the Legislature in approving the constitutional amendment to create a Superintendent of Public Works.

After the report of the investigating commission had been presented on February 15, a review of which has been given already, the Governor sent a special message to the Senate, with several recommendations, among them being the following: that existing contracts for extraordinary repairs be canceled and appropriations for them be repealed; that \$400,000 be provided for closing these contracts, upon the certificate of the State Engineer; that \$400,000 be appropriated for improving the channel of the Erie to a full seven feet and \$15,000 for a survey to determine the real condition of the canal; that further funds be provided to gradually increase the depth to seven and a half or eight feet; and that the canal board be given full powers of investigation and redress in canal matters. In commenting upon his plan for deepening the canal, the Governor said: "It would benefit the boatmen and carriers more, even, than one cent a bushel remission of tolls. It would be of more real utility to navigation than five or ten times its cost expended in the average manner of so-called improvements on the public works. But it is too simple, too practically useful, to enlist the imagination of projectors . . . and of engineers."⁸²

In reply to a Senate resolution asking for information and opinions concerning this proposition from the Governor, the canal commissioners strongly opposed the project, saying that,

⁸¹*Assembly Documents*, 1876, No. 27, pp. 179-180.

⁸²*Senate Documents*, 1876, No. 60, p. 3.

without a corresponding change in structures, the gain derived from a deepened channel would be so small as to result in no substantial benefit to navigation nor any cheapening of transportation, and that the cost of adapting locks, aqueducts and culverts to the increased depth would be so large as to exclude such changes from serious consideration. The commissioners estimated the cost of deepening the prism, without altering structures, at \$4,500,000, but feared lest the proposed excavations might imperil existing walls.³³

The Legislature of 1876 earnestly undertook the work of reform, as recommended by the Governor, both in canal affairs and otherwise. The constitutional amendment to abolish the office of canal commissioner and to create a Superintendent of Public Works—to be appointed by the Governor, with the consent of the Senate—was again approved, and at the following November election was adopted by the people by a large majority. The canal board was given the powers of investigation and redress in matters pertaining to the canals, including those of the past (chapter 388). The State Engineer was empowered to appoint the regular engineers of his department, and to employ additional engineers, when necessary, with the consent of the canal board, and all of these men were required to take the constitutional oath of office (chapter 385). Despite the adverse report of the canal commissioners, an appropriation of \$400,000 was made for deepening the Erie and Oswego canals to a full seven feet, and another of \$15,000 for a survey to ascertain the condition of the Erie. This act also directed the canal board to terminate such of the contracts for extraordinary repairs as in its opinion were not necessary, providing \$100,000 to settle these contracts and repealing all former appropriations for this class of work that were still in force (chapter 425). The report of the State Engineer and the canal commissioners, relative to the disposition to be made of the lateral canals, not having proved satisfactory, the Legislature appointed a special commission for this purpose (chapter 382). As this subject is considered in a chapter by itself further references to it will be omitted from this portion of the volume. Improvement in steam propulsion was encouraged

³³ *Senate Documents*, 1876, No. 74.

by an act (chapter 387) authorizing the setting apart of a portion of the canal in which Hugh Stevenson and Enos W. Pelonbet might experiment with their systems.

Thus the Governor's reforms were carried into effect. There followed a policy of retrenchment and of little activity in improvements, which was not broken till necessity compelled the lengthening of locks in an attempt to enable the canal to cope with increasing competition. Concerning the general results of this period, the verdict of the standard historians of the state may be safely taken. It is a matter of history that, though comparatively few convictions resulted from many arrests, the power of the "ring" was broken and reformation followed. Tilden's reform spirit left its mark upon the public conscience, throughout municipality, state and nation. The responsibility of officials was viewed differently and there was a more rigid accountability of public expenditures.

Navigation opened May 4, 1876, and closed December 1. The tons of total movement diminished to 4,172,129, valued at \$113,090,379. The canal commissioners reported it a season of excellent navigation at reduced expenses for maintenance, but of continued business depression.

During the year a careful survey of the Erie canal was made by the State Engineer, in accordance with the Governor's recommendation and the resulting law. This was the survey which, eighteen years later, although obviously of too remote a period to be of much use, had to be depended upon as the chief source of information for making the first estimate for what was later known as the "Nine-million improvement," when the Constitutional Convention of 1894 required such an estimate from the State Engineer within twelve days. The canal commissioners, in 1876, reported that this survey showed that there was no need to use the money which had been appropriated to give the canal a depth of seven feet. Mr. John D. Van Buren, Jr., the State Engineer, taking office in January, 1876, had been a member of the investigating commission, and he brought to his department the spirit of reform, instituting a mathematical examination, which the engineers were required to pass. This, of course, was before the day of State civil service regulations.

The history of the Erie canal for the next few years presents more of economic than of engineering interest. The people of the state had become aroused to the necessity of a careful and economical control of canal expenditures and the administration of Governor Robinson stood pledged to the exercise of rigid economy in the expenses of maintenance. Moreover, a constitutional provision limited the annual expenditures to the gross amount received during the previous year.

The Erie alone of all the canals during 1876 produced a surplus over expenditures, the amount being \$508,953.14. Owing to short crops, low rates and competition of tide-water railways, the year was one of unprecedented disaster to boating interests. Every branch of business had been depressed. The receipts from tolls as well as the expenses of maintenance were less than the year before. Of about six thousand boats on the canal system many were laid up, others ran at a loss and none at a profit. It was urged by the Governor that only reform and retrenchment could save the canals of the state from utter ruin. Yet the tolls must be sufficient to pay the expenses of operation and repair.³⁴

In his next annual message³⁵ the Governor admitted that conditions had largely improved during the previous year. Railroad competition was less ruinous. Crops were abundant. Better rates of freight prevailed, and all boats were in service. Yet only sixty-nine boats were built during the year—being the lowest number for at least twenty years past.

Not anticipating this traffic improvement, however, the toll-sheet, which was fixed by the Legislature in each year, had been made unusually low, and the canal revenues did not keep pace with improved conditions, being the lowest in forty-five years. A quarter-mill tax was therefore recommended to supply the deficiency. Only the Erie again showed in 1877 a small net surplus over expenses, the amount being \$84,840.88 in this year.

A Senate resolution of inquiry as to the expense of lengthening canal-locks forty feet, brought out an adverse report from the Engineer's department. The difficulty and expense of making the proposed change at Lockport were urged as the chief reasons.

³⁴ *Governor's Annual Message*, 1877.

³⁵ *Governor's Annual Message*, 1878.

The question of steam versus horse-power propulsion had been anxiously studied for several years, but so far, in the opinion of the State Engineer, the attempts to substitute steam had not displaced animal power. Statutory permission was given to test various methods of steam towage, among which the Stevenson system (chapter 366, Laws of 1877) and the Baker single-rail system (chapter 371, Laws of 1877) were included. State Engineer J. D. Van Buren, Jr., in his report presents some interesting facts and conclusions. An important series of dynamometrical tests were made to determine the tractive force required to move boats through the water of the canal at different speeds.

The average weight of a first-class, horse-propelled, grain boat was then about sixty-five tons; its cargo of grain weighed about two hundred and thirty tons. It was found that an average loaded boat on the canal, at an average speed of about 1.55 miles per hour, developed a tractive pull of about three hundred and thirteen pounds. This was considered as the maximum amount of work which an ordinary pair of canal horses could continuously perform. With similar conditions of boat and speed it was found that steam towage, by means of an ordinary screw-propelled tug, with about three hundred feet of hawser attached, developed a much larger resistance, increasing with the speed. This was owing to the rapid current thrown back by the propeller in the confined waterway of the canal.

The average rate of speed of a horse-drawn boat was shown by comparison of numerous records to be 1.55 miles per hour. There was a slight difference in speed between east-bound and west-bound boats owing to the fact that there is a mean easterly current in the canal of about one-fourth of a mile per hour. Four horses were used to a boat—in pairs—working alternately in six-hour shifts. It was further deduced that the average work thrown upon each canal horse was 20,034 foot-pounds per minute, equal to six-tenths horse-power, or for a whole day of twelve hours (six hours on and six hours off), 14,424,480 foot-pounds. From this it could be seen that canal horses were overtaxed and the condition in which they were kept at that time was not only poor economy but a disgrace to civilization.

The average time of a horse-drawn boat for a round trip from Buffalo to New York and return was thirty days. In an average season of two hundred and ten days there were seven round trips. The cost of carriage of a bushel of wheat by horse-drawn boat, exclusive of tolls and terminal charges, from Buffalo to New York was computed at 5.69 cents. In 1862 the average tonnage of a boat was one hundred and sixty-seven tons and the average time from Buffalo to Troy was eight and one-half days as against ten days in 1877. It was considered questionable whether in view of all circumstances boats were not then above the most economical size.

As among the first efforts at steam propulsion the following may be of interest:

The Baxter boat was ninety-six feet long by seventeen feet beam, with nine feet depth of hold. Displacement, two hundred and sixty-four tons. Capacity, about two hundred and seven tons. With two hundred tons cargo it should draw five feet and ten inches of water, and was propelled by a pair of three-bladed screws, one on each side of the stern, revolving toward each other. An upright boiler and engines completed the equipment. The estimated cost per bushel of wheat from Buffalo to New York by this method was 5.76 cents.

The Belgian cable-towing system consisted of a wire cable laid in the bottom of the canal. A clip drum was mounted upon the deck of a tow-boat over which the cable was lifted and passed. The drum being operated by steam drew the tug and its attached "trailers" through the canal at a speed of about two and one-half miles per hour. The estimated cost per bushel of wheat by this method from Buffalo to New York was 4.79 cents. But the installation of equipment including tugs and cable was estimated at \$3,450,000, and the annual cost of maintenance about \$1,600,000.

The Frick or Pennsylvania system of coupled boats, either horse-propelled, or by steam-power on the rear boat, was considered an improvement in the way of economy. The speed was computed at about two and one-half miles per hour by steam and the cost of freight per bushel from Buffalo to New York—four hundred and ninety-five miles— at 4.72 cents.

The average canal freight rates per bushel of wheat from Buffalo to New York for the season of 1877, to September 1, was 7.39 cents; for the balance of the season, 9.53 cents.

Commercial interests for some time had been trying persistently and openly to secure a free canal system, and Auditor Schuyler was an earnest advocate of the plan. In presenting arguments⁸⁶ therefor, he stated that 170,000,000 tons of freight had been transported over the canals since their opening. It was alleged by those who opposed free canals that the expenditures for canal purposes, since their opening, exceeded their revenues by nearly \$35,000,000, and that this sum represented their net cost to the people, raised by taxes. Admitting this for the purpose of comparison, the State owed by far the largest share of its prosperity to the canals. The total amount of tolls collected since the opening of the canals was \$130,034,897.09. But in addition to this, during the preceding forty years, the carriers of the canal were paid for transportation \$146,868,964, exclusive of tolls, and the merchants and warehousemen were estimated to have received at least \$100,000,000. These sums were direct benefits to the people of the state from the tonnage of the canals, to which should be added the almost incalculable benefits resulting from the increase of wealth and population. The population of New York City had increased from 123,706 in 1820 to 1,046,037 in 1875; the value of real and personal property in New York City had increased from \$69,530,753 in 1820 to \$1,234,191,178 in 1877; the population of the State had increased from 1,372,812 in 1820 to 4,705,208 in 1875, and its aggregate valuation, real and personal, from \$256,021,494 in 1820 to \$2,755,740,318 in 1877. The auditor's strong plea for the abolition of canal tolls asserted that the tonnage of the canals had brought to New York City the commerce of the world, and had made the Empire State what it was.

On February 8, 1878, under the new constitutional amendment, the control of the canals passed from the canal commissioners to the Superintendent of Public Works.

The improvement in transportation which began about July 1, 1877, continued in marked degree throughout 1878; the building

⁸⁶*Report of Canal Auditor, 1877.*

of boats was resumed; three hundred new boats were registered during the year, and nineteen steam-propelled boats were in use. The canals were opened April 15 and closed December 7—a period of two hundred and thirty-seven days as against two hundred and fourteen days in 1877 and two hundred and eleven days in 1876, the average open season for the preceding twenty years being about two hundred and nineteen days.²⁷

The expenditures under the new system of control were decreased nearly fifty per cent under the corresponding period of the previous year. Although the rates for tolls remained comparatively low, both the tonnage and the amount received were largely increased. The net income of the Erie canal for the fiscal year, after deducting all repairs, charges and payments, was \$321,403.18.

The State Engineer in his report²⁸ says of this period: "Only in the years 1861, 1862, 1863, when the Mississippi river and other routes were closed against northern commerce by the war, have the Erie and Oswego canals carried as much grain as during the past season; and this has been done in the face of the lowest prices ever charged by the railroads in their efforts to control the carrying trade."

At one time during this season the rate was four and one-half cents per bushel as against the lowest rate of eight cents in 1874 from Buffalo to New York. It was claimed that this increase in tonnage was caused by low rates and was the controlling factor in opening a larger foreign trade for our products, which resulted in the turning of the balance of trade in our favor to the amount of \$250,000,000.

The Comptroller stated that the only debt remaining upon the State was the canal debt, which on September 30, 1877, was represented by outstanding obligations amounting to \$9,900,360, exclusive of the sinking fund applicable thereto of \$1,270,343.71.

An interesting bit of history was recalled in this connection. That portion of the New York Central railroad originally called the Utica and Schenectady railroad, chartered in 1833, had no right under its charter to carry freight. In 1836 another link, then known as the Utica and Syracuse railroad, could carry freight

²⁷ *Governor's Annual Message*, 1879.

²⁸ *Report of State Engineer*, 1878, p. 5.

only by the payment of regular canal tolls to the commissioners of the canal fund. In 1844 all of the railroads along the line of the Erie canal were allowed to carry freight, but only upon payment of similar tolls. By the Legislature of 1851 *all railroad tolls were remitted*. "Every dollar of tax paid for the canals," said the State Engineer, "is the result of this act."³⁹

The commerce of the Erie canal was at this time gravely threatened by the approaching completion of extensive improvements, at a cost of over \$30,000,000, in the Welland and St. Lawrence system of Canadian canals. These improvements would permit the passage of boats drawing thirteen and one-half feet of water over the lock miter-sills and enable vessels of two thousand tons to load direct for Europe at the docks of Cleveland, Toledo and Chicago.

It was urged by those familiar with the conditions that the cost of transportation by way of the Erie canal should be reduced, not only by the removal of lake obstructions by the United States Government to permit the use of much larger vessels to bring their cargoes at a lower rate to the port of Buffalo, but by improvements to the canal itself. This could be accomplished either by lengthening its locks, or by deepening its channel. State Engineer Horatio Seymour, Jr., advocated⁴⁰ the deepening of the channel at least one foot, by lowering the bottom in some places and raising the banks in others, thus adding fifty tons or twenty per cent to the cargo of each boat then in use. Afterward this became known as the "Seymour Plan" of canal improvements. Power appliances to operate lock-gates and to draw boats through the locks were also advocated. The time then consumed in passing the seventy-two locks of the Erie canal was about eighteen hours. The new method would reduce this time by at least one-half with the existing depth of water. With one foot of water added, both improvements would allow a boat drawing six feet of water to effect a saving of thirty-seven hours in each round trip.

Various commercial interests were constantly effecting a reduction in specific rates of toll. Flour, leached ashes and petroleum were this year added to the free list, which already contained

³⁹ *Report of State Engineer, 1878, p. 14.*

⁴⁰ *Report of State Engineer, 1878.*

hogs, bacon and salt pork, cattle, salt beef and tallow, sheep and wool, hemp, grass and clover seed, furs and fur skins, boats, lead, leather, tobacco (not manufactured), lard, lard oil, corn meal, coffee, hops, dried fruit, domestic spirits, cotton and domestic cotton and woollen goods. Passengers over ten years of age were charged one-half mill per mile. The canal auditor urged the passage of a constitutional amendment for the abolition of canal tolls as being necessary to meet changed conditions which time and enterprise had wrought. Evidently, official opinions as to canal policy were at variance, as the Superintendent of Public Works, in his report⁴¹ covering the year 1879, vigorously complained that the toll-sheet was already dangerously low for proper maintenance, and urged the creation of a surplus fund from excess revenues, for extraordinary repairs.

Under the constitutional limitation and the amount of canal receipts applicable to the payment for repairs and maintenance, rigid economy was necessarily the continued policy of canal management in 1879. To use a homely expression, the canals were said to be "living from hand to mouth." Although the open season was shortened to two hundred and twelve days the tonnage was increased by about 200,000 tons. The receipts for tolls were less because the rates were fixed at the lowest point in the history of the canals.

The number of steamboats in use was slightly increased, and three hundred and eighty-two boats were built and registered during the year. Trial of the Cooke system of propulsion, by submerged rail and tractors, or floating locomotives, was authorized by chapter 539, Laws of 1879. The canal was equipped during the season from Rochester to Buffalo with the Belgian towing system, and it was confidently expected that the entire canal would be similarly equipped during the next year and all traffic conducted by steam-power.⁴²

A deficiency canal tax of three-tenths mill was levied by chapter 27; and it was made a misdemeanor to bribe a lock tender by chapter 403 of the laws of this year.

To the free list were added butter, cheese, flax seed, oil meal and oil cake.

⁴¹*Assembly Documents*, 1880, No. 69.

⁴²*Auditor's Financial Report*, 1879.

Trade conditions continued to be the leading subjects of discussion. The advantages which the Erie canal possessed, as being the first effort to render available the only natural trade channel between the West and the Atlantic coast, were regarded as imperiled by the results of the competitive struggle between eastern cities for commercial supremacy. Railway rates were then less to Baltimore and Philadelphia than to New York City. The latter exhibited a falling off in the percentage of total receipts from the West by seaboard cities.⁴⁵

The auditor complained that the railway lines continued in their efforts to divert from the canal and absorb east-bound traffic, to name ruinously low rates during the season of canal navigation, being able to recoup their losses during the winter.

The requirement that the canal should be self-supporting and still confine expenses within the amount received for tolls, left no margin or fund for extraordinary repairs, and in case of disaster by flood or otherwise the canal was in constant danger of being closed without warning to traffic. These conditions operated to discourage boat-building and boating interests. It was authoritatively stated that the canal as it was at this period was entirely capable of passing double the tonnage thus far transported.

In the report of the Superintendent of Public Works the opinion was expressed that the immense exportation of American cereals for the preceding three years was not due to their cheapness here but to successive failures of crops in foreign countries.

He also intimated that if the same principles of business management and economy, which had made the railroads their successful competitors, were applied to the canals, all fear of losing their share of the carrying trade would vanish. In view of the fact that Montreal is one hundred and forty-seven miles nearer Chicago by way of the Canadian canals than is New York by way of the Erie, the State Engineer again in this year called attention to the danger of Canadian competition.

A glance at the history of the Erie canal during 1880 presents comparatively little of interest to record. The net canal debt,

⁴⁵*Annual Report of State Engineer, 1879.*

after applying sinking-fund balances, was \$6,936,879.83, at the close of the fiscal year. In November the canals were unexpectedly and suddenly closed by an ice blockade in which about a thousand boats were caught in transit. Three-quarters of this number were grain-boats whose cargoes aggregated 6,000,000 bushels. Yet, notwithstanding this drawback, the season of two hundred and twenty days witnessed a further increase in traffic.

The gross receipts of the Erie canal were \$1,120,660.13. It may be noted, however, that it required two-thirds of this sum to pay the expenses of maintenance and collection, the net surplus being \$442,535.71. The auditor's report for this period shows the aggregate tonnage of both canal and railroads (Erie and Central) for twelve months prior to September 30, 1880, to be 25,706,586 tons, of which the railroads carried about three-fourths, or 19,248,930 tons.

The number of boats registered was four hundred and eighty-eight, of which four hundred and thirty-three were new. Various methods of towage were given further trial. The award of first prize, out of the one hundred thousand dollars appropriated by the Legislature of 1871 for the purpose of stimulating towage inventions, had been given to William Baxter, but his boat had later been pronounced a failure, and at this period not one was known to be in existence. This boat, however, led to the construction of other forms of steam-propelled boats which were increasing in number. About one hundred and twenty miles of the Belgian cable system had been laid and was in operation during the season, but failed to meet the expectations of its friends. It was said to be not only in the way of other traffic but a menace to the security of the canal bank upon the inner side of curves. The Illinois system of steamer pushing its consort was further used but it was determined that longer boats could not be used to advantage on the curves of least radius.

The application of water-power by means of a turbine wheel operating a towing hawser seems to have been in successful operation at lock No. 52. By the aid of this mechanism boats were drawn into the lock at increased speed and time was saved.

The State Engineer reiterated his warning of the year before as to the danger of Canadian competition. In view of the rela-

tive percentages of canal and open waterway between the Erie route and its commercial rivals, he pertinently remarked that it cost four times as much to carry grain upon the Erie canal—mile for mile—as upon an open lake waterway.

The increasing free list was the subject of severe criticism by the canal auditor;⁴⁴ it was held to be without warrant of law, and unfair, resulting in an added tax to supply the deficiency. The growing custom of authorizing the construction of numerous and expensive lift or swing bridges to be paid for out of canal tolls was also condemned, as such bridges were not only of no benefit to navigation, but an obstruction to it. The benefit, if any, was entirely local and should be paid by the locality benefited. In the methods of collecting tolls, moreover, small frauds were beginning to creep into the service, and to correct this a flat rate of toll per ton-mile was advocated, with a more frequent use of weigh-locks.

Excessive terminal charges and various extortions which came out of the boatmen's pockets were the subject of investigation by a committee on terminal charges, created by the Assembly, March 11, 1881. In New York the committee found⁴⁵ the charges to be: for elevating, one-half cent per bushel—chargeable to the boat; weighing and storage, one-half cent per bushel—chargeable to the grain; cleaning, one-quarter cent (optional); lighterage from store to vessel, one and one-half cent. Boston, Philadelphia and Baltimore elevator charges were from one and one-quarter to one and one-half cents. There was in addition a "shortage" of from five to forty bushels in reweighing, a loss which also fell on the boatman. The committee advocated increased and exclusive wharfage room for canal boats, together with the abolition of the harbor-master's dues of \$1.25 per boat. It was also claimed that the State could, if deemed necessary, exercise statutory control over terminal rates. (See Otto U. S. Reps. vol. 4—Opinion of Waite, C. J.)

At Buffalo the practice of "scalping" grain insurance premiums had grown to such proportions that for two years at least \$50,000 had been paid in "rebates." The average cargo

⁴⁴*Auditor's Annual Report*, 1880.

⁴⁵*Assembly Documents*, 1881, No. 114.

of grain cost \$25.00 premium to insure; of this \$2.50 went to the broker or "scalper"; \$10.00 rebate to the shipper; \$3.75 to the insurance agent, and the balance, \$8.25, to the insurance company for carrying the risk. All of this, being included in freight charges, was a loss to the boatman.

The season of 1881 was marked by a large falling off in the volume of traffic and receipts. The former amounted to over a million and a quarter tons, or twenty per cent, and the latter, over half a million dollars, or forty-five per cent. The loss in revenue was partly due to the removal of tolls on west-bound traffic, but as the auditor remarked, this expedient, undertaken as a stimulant to traffic, had, upon trial, proved a failure. Governor Cornell gave as further reasons for the lessened volume of traffic the limited movement of grain products and the unusually strong trunk-line railway competition.

Still lower freight rates prevailed. The average canal rate for a bushel of wheat from Buffalo to New York for the season was 4.88 cents, which included 1.03 cents toll. The carrier's net profit for nearly five hundred miles of transportation ranged from ninety and one-half to one hundred and twenty-eight cents per ton. The report of the auditor's department, as to financial results for the fiscal year, was the most discouraging since the opening of the canal; the aggregate revenues were lower than since 1825; for the first time in fifty-six years no payments could be made from the revenues to the sinking-fund or interest accounts; and the revenues were twenty per cent below the cost of maintenance. From the boatman's point of view the situation was even more discouraging. Notwithstanding the continued efforts of the Legislature and the canal board to stimulate traffic by reductions and remission of tolls, his earnings had steadily decreased until no profit remained and a probable loss faced him.

The number of boats—old and new—registered during 1881 was three hundred and sixty-eight, with an average tonnage of one hundred and eighty-eight tons. The Erie canal exhibited this year a net loss, of all payments over receipts, of \$27,029.17. The net canal debt September 30, 1881, deducting balances, was \$6,560,378.43.

The attention of the Legislature was called by the auditor⁴⁶ to the probability of a grave crisis in canal affairs in case the income of 1881 should prove to be below the necessary amount required for expenses in 1882. If this should be the case, the canals would have to cease operations for lack of funds. The prompt abolition of the constitutional restriction alone could save them. Two propositions for constitutional amendments were before the Legislature of 1882: the first, to relieve the canal revenues from payments on account of the canal debt, leaving the surplus revenues over expenses, if any, for a deficiency fund, had already been embodied in a concurrent resolution passed by the Legislature of 1880; the second, which had been indorsed by both political parties in their respective conventions, and which provided squarely for the abolition of all tolls and the maintenance of the canals by taxation, had passed the Legislature of 1881. Either of these would remove the constitutional restriction as to expenditures.

The effect which differential freight rates had upon canal traffic and upon the interests of the people of the state, and especially of New York City, had been for some time a matter of anxiety. The auditor strongly commented⁴⁷ thereon. This "differential," it may be explained, was the result of a traffic agreement as to east-bound freight between all the seaboard rail lines, whereby lines whose terminals were in New York City were to charge an additional sum upon every ton of such through freight over the rate charged by lines whose terminals were in Boston, Philadelphia and Baltimore. Prior to 1870 this "differential" had been for several years about two dollars per ton, an equivalent of six cents per bushel on wheat, and for the same period this had been the average canal rate of toll per bushel. Later the canal tolls were reduced one-half and the differential was promptly lowered to one dollar per ton. In 1880 the toll was 1.03 cents per bushel and the differential was from forty to sixty cents per ton.

The gradual diminution of canal tolls on east-bound grain had been for years followed by corresponding reductions in preferen-

⁴⁶*Auditor's Annual Report*, 1881.

⁴⁷*Id.*

tial rates allowed by New York railways. Nevertheless, the percentage of New York receipts of grain by rail at this time, as compared with that of other seaboard cities, had fallen off considerably. The argument was advanced that, without the restraining influence of the canal, the railway differential rates could not be controlled; that values in New York City would suffer an immense shrinkage and that the whole state would reflect the depressing influence of her commercial decline.

Aside from the vexing question of "free canals," which was before the people at the November election of 1882, there appears to have been little of interest to record in connection with the history of the Erie canal during that year. The amendment to the State Constitution, providing for the abolition of canal tolls, having passed the Legislatures of 1881 and 1882, came before the people and was approved by the decisive vote of 486,105 in favor of and 163,151 opposed to the amendment.⁴⁸

Traffic showed a slight improvement over the previous year. The tonnage in 1882 was 5,421,720, a gain of 277,843; tolls collected amounted to \$655,195.51, an increase of \$23,574.45. The gross receipts of the Erie for the fiscal year were \$591,369.79; gross expenses for the same period, \$504,948.77; net income, \$86,421.02. Net canal debt on September 30, \$6,259,661.43, a reduction of \$300,000.⁴⁹

The navigable season was two hundred and forty-one days as against two hundred and eleven days in 1881. Only ninety-three new boats were registered.

The constitutional amendment became operative on January 1, 1883, and thereafter no tolls were collected upon the canals of the state. As Governor Cleveland said of it,⁵⁰ the people had now voluntarily surrendered their constitutional safeguard of control over the limit of expenditures in their devotion to the interests of the great highways of the state. But that did not mean that they had forgotten the era of extravagant expenditures which had theretofore made the canals a scandal and a reproach. On the contrary, they demanded continued economy of administration, consistent with the use of the canals to their utmost

⁴⁸*Legislative Manual*, 1904, p. 191.

⁴⁹*Canal Auditor's Annual Report*, 1882.

⁵⁰*Governor's Annual Message*, 1883.

capacity at the lowest possible cost. All schemes for enlargements or expensive improvements should be stubbornly opposed.

In view of the fact that no more revenues were to be derived from canal tolls the following summary was presented by the auditor:⁵¹

Erie Canal.

Gross revenues to date.....	\$121,461,871.09
Collection, superintendence and ordinary repairs.....	\$29,270,301.16
Cost of construction and im- provements	49,591,852.68
Total cost	78,862,153.84
Leaving balance to credit of Erie to date.....	<u>\$42,599,717.25</u>

exclusive of interest on the debt for construction and improvement. But it should also be noted that it is exclusive of the value of the plant at that date.

It was urged by the State Engineer and the auditor⁵² that remission of tolls alone would not suffice to increase canal tonnage. This theory had been repeatedly tried and proved a failure. The controlling reasons why the canals had not kept pace with the railways had been the niggardly policy displayed in their management. Aside from enlarging the prism and locks, the same antiquated methods and appliances were still in use. Larger boats were in use, it is true, but without doubt they were too large for economical animal towage in the prism of the canal and so consumed more time than was proper in transit. It was essential to increase the speed of boats to compete successfully.

By other routes steam transportation had displaced more primitive modes. It had proved a failure upon the canals because of the faulty design of the boats, which in the constricted waterway and with slow lockage could not reach a remunerative speed. The lengthening of the locks by the use of tumble-gates and a strong organization of boatmen with western agents seeking trade was advised.

⁵¹*Canal Auditor's Annual Report, 1882.*

⁵²*Id.*

In contrast with the canal policy as above outlined, the State Engineer, in his report⁵³ for 1882, adverted to the progressive policy of the railways since the first canal enlargement was authorized. At that time a commission of prominent engineers investigated the subject of cost of transportation, with the following conclusions: cost of railway transportation—level road—per ton-mile, three and one-half cents; cost of Erie canal transportation—including locks—about one cent per ton-mile. If level, or without locks, still less. This comparison of rates was doubtless a strong factor in shaping the canal policy of enlargement at that time.

In 1835 there were in New York State but one hundred miles of completed railway. In 1882 there were over sixty-six hundred miles, with western connections having vast ramifications reaching out to every portion of the grain belt of the country. Every device for lessening cost of transportation had been put into service; alignments and grades had been straightened and reduced; the Erie had double-tracked and the Central had quadruple-tracked their lines; steel bridges replaced wood; heavy steel T-rails replaced straps; locomotives had quadrupled their power, until in 1882 the cost of railway transportation had been reduced from three and one-half cents to one-half a cent per ton-mile.

The subject of encroachments by railways upon canal lands seems at this time to have been a matter of public interest; so much so, that in the case of the West Shore railroad—then building—it became the subject of legislative inquiry. In response to an Assembly resolution of February 26, 1883, the Superintendent of Public Works stated that it had been the practice of his predecessors to grant permits for such encroachments under suitable conditions as to maintenance of waterway, etc., the permits being based upon the authority of section 17, chapter 276, Laws of 1834, and the general railroad law of 1850, chapter 140. On April 8, 1881, the Superintendent of Public Works revoked these permits, apparently on constitutional grounds, and the matter was then taken to the Supreme Court in proceedings for condemnation and appraisal of damages, and on September

⁵³*Senate Documents*, 1883, No. 9.

7, 1881, Judge Churchill held that the permits were not unconstitutional. Thereafter new permits were granted. Between Schenectady and Utica about twelve miles were thus occupied, within the blue line, by the West Shore railroad.

In the way of legislation Governor Cleveland recommended abolishing the offices of canal auditor, the board of audit and board of canal appraisers, in the interests of economy, promising a saving of at least thirty thousand dollars. It was noted that the expense of maintenance of the board for the previous year had been—exclusive of awards—nearly forty thousand dollars, of which over fifteen thousand dollars had been paid as fees to attorneys to defend the State against claimants.

By chapter 69, Laws of 1883, the office of canal auditor was abolished, and the records were transferred to and became a bureau of the Comptroller's office. By chapter 205, Laws of 1883, the offices of canal appraiser and State board of audit were abolished and a board of claims was established, to take effect June 1. By chapter 165, Laws of 1883, the offices of collector of tolls, weighmasters and assistants, were also abolished.

At Little Falls an interesting part of the works of the Western Inland Lock Navigation Company, known as the "upper lock and stone bridge," were transferred by chapter 448, Laws of 1883, to a commission for preservation as a historical relic.

In 1883 an event occurred, inconspicuous in itself, but which is perhaps worthy of record as being the first public act in the chain of events which may be designated as the modern era of canal improvement. A legislative bill⁶⁴ was introduced by Assemblyman Leighton to lengthen lock No. 46, at Utica, and to appropriate money for the purpose. The journals of both houses show its passage and transfer to the Governor for his signature, but a careful search among the papers of the archivist and in the offices of the Governor and Secretary of State fails to reveal any record of its reception. It was undoubtedly "a thirty-day bill," and failing to receive the executive signature, expired by limitation and is not of record among the statutes of that year.

The open season of 1883 was but two hundred and nine days. As to traffic conditions remarkable development was shown;

⁶⁴*Assembly Journal*, 1883, p. 360.

the tonnage for the year was 5,775,631, an increase of 324,350 tons.

Governor Cleveland remarked⁶⁶ that the exhibition of the canal business for the year 1883 fully justified the policy adopted by the people of relieving commerce from the burden of tolls. The grain shipments from Buffalo over the canal were 42,350,916 bushels as against 29,439,688 during the previous year, a proof of the fact that the increased commerce was attracted to this route by the abolition of tolls.

The Comptroller, however, attributed⁶⁶ the increase to the unusual and general movement of freight through the state. Railway freight traffic was increased and higher rates prevailed. The increase in canal tonnage had been disappointing, he said, and there was no revival of interest in boat-building.

It is extremely difficult for the impartial historian to arrive at a just estimate of the canal situation at this period, owing to the divergent opinions then held by State officers, and freely expressed in their official statements of about the same date. The retiring State Engineer, whose own office at that time it was seriously proposed to abolish, criticised⁶⁷ the policy of insignificant appropriations which had prevailed, as being sufficient simply to maintain navigation in the dilapidated canals and entirely inadequate to put them in good condition. Local steamboat and excursion traffic, other than the regular towing boats, at comparatively high speed was constantly washing away the canal banks and doing damage that required many thousand dollars to repair. The accumulated silt in the bottom of the canal, caused by the wash from high ground and from the sewage of many cities and villages along the line, called for a thorough cleaning out of the prism. The experiment of "free canals," said the State Engineer, was a failure; their tonnage was more dependent upon the law of supply and demand than upon tolls, and finally "it was a foregone and inevitable conclusion that *the canals must go.*"

The net canal debt on September 30, 1883, was, after deducting balances, \$5,852,606.94, a reduction within the year of \$635,200.

⁶⁶ *Governor's Annual Message*, 1884.

⁶⁶ *Comptroller's Report*, 1883.

⁶⁷ *Report of State Engineer*, 1883.

In view of this conflict of official opinions, it may be well to seek for outside sources of information. The colossal increase of traffic between the western states and the Atlantic seaboard had by this time caused the question of cheap transportation to become one of national importance. In December, 1872, the President called the attention of Congress to it. A Senate committee made a thorough and elaborate examination of the subject. In the first session of the forty-eighth Congress a bill (H. R. 3538) to aid the State in enlarging its canal by an annual appropriation of \$1,000,000 for ten years was reported. The benefits to the City and State of New York have heretofore been summarized in speaking of the events of 1877, so that it is needful here simply to refer to the report of this Congressional committee in the following brief form.

New York State possessed the key to the commercial situation. The Erie canal has done more to advance the wealth, population and enterprise of the western states than all other causes combined. The value of the public lands has been increased. The western grain regions were directly interested in the development, improvement and maintenance of this great waterway. It was of supreme importance to the people of the United States to sustain this great regulator of freight charges. The Erie canal paid the people of New York State well in its period of highest rates, 1862 to 1869, when the tolls averaged six and one-quarter cents per bushel; it still paid when tolls were reduced one-half, 1870 to 1874; and now the people, in a liberal, catholic spirit, had abolished tolls entirely and had thrown open the canal, free to the commerce of the world. The only hope of the people against the combined influence of the power and capital of railway interests lay in the Erie canal. It was directly beneficial to at least twenty millions of people in twelve western states, and had demonstrated that the greater the facilities the less the cost of transportation.

Senator Windom, in a speech⁵⁸ on the Senate floor in 1878, said that canal rates exerted an influence over all other rates from the Gulf States to the St. Lawrence river, and from the Atlantic ocean to the foot-hills of the Rockies, and in support of

⁵⁸House Report 628, 48th Congress, 1st Session.

this statement introduced a letter from Albert Fink, then Railway Trunk Line Pool Commissioner, who said in substance that wherever rates from Chicago to New York were reduced, by reason of the opening of the Erie canal, this reduction affected rates from all interior cities, as St. Louis, Indianapolis and Cincinnati. If the direct lines from such points did not at once meet the reduced water rates their freights would reach New York by way of Chicago, lake ports and the canal, and the direct lines would be left without business. It also affected Boston, Philadelphia and Baltimore rates, and the rates from South Atlantic ports and the southern states generally, until it reached the line of influence of low ocean rates. All rail rates are kept in check by water transportation. The source of this statement, coming as it did from the one who was then acknowledged to be the best-posted railway manager in the United States, would seem to give to it the binding force of testimony elicited on cross-examination.

According to the Governor's next message,⁵⁹ the condition of the canals for the season of 1884—their business and their management—compared favorably with previous years. No substantial improvements had been made for several years, and the Governor recommended that an earnest effort be made to restore and renew the various structures connected with it. Skilled mechanics, however, had been employed upon the masonry and woodwork during the year, with good results. Twelve gravel scows, each with eighty cubic yards capacity, had been put in service, and the tow-path and banks were being raised and put in good condition.

The subject of radical changes and improvements in waterways for the transportation of western products to the Atlantic seaboard was one which engaged the attention of numerous engineers throughout the country. The inadequacy of the Erie canal, as it then existed, to handle the enormous and constantly increasing traffic and to at least control the rates upon, if not to successfully compete with the vigilant and up-to-date railway systems, was almost universally conceded by those who had made a study of the situation. Various plans were advanced to meet required conditions.

⁵⁹*Governor's Annual Message, 1885.*

At the annual meeting of the American Society of Civil Engineers,⁶⁰ in June of 1884, Elnathan Sweet, the State Engineer, presented a project for a ship canal across the State of New York, to follow the general route of the Erie canal but with radical changes at different points, both in route and profile. The prism was to contain eighteen feet depth of water, by one hundred feet width on the bottom; the locks were to be four hundred and fifty feet long by sixty feet wide; and by a continuous descent to the east the supply of water from Lake Erie was to be discharged into the Hudson river. Summarized, the plan was: to widen, deepen and rectify the worst curvatures of the existing canal from Buffalo to Newark, one hundred and thirty miles; to construct a new canal from Newark to Utica, one hundred and fifteen miles, by a change of alignment to the south near Newark, crossing Canandaigua outlet and thence on the south side of Clyde river, crossing Seneca river near its junction with Cayuga lake outlet, where for nearly two miles it would require an embankment and aqueduct fifty feet above the river, and recovering the present alignment east of Syracuse; to canalize the Mohawk river from Utica to Troy, about one hundred miles; and to improve the Hudson river for thirty miles south of Troy.

The cost was roughly estimated at from one hundred and twenty-five to one hundred and fifty millions of dollars, and the probable tonnage from twenty to twenty-five millions per annum. Lake propellers were to pass through this canal to New York without transshipment of cargo.

The discussion which followed was participated in by a score of prominent engineers, members of the American Society of Civil Engineers, with the result of bringing to light various interesting plans as substitutes for the one proposed. As these men voiced the most enlightened public thought, which had been dealing with this subject for the previous quarter of a century, their opinions are pertinent here.

A prominent railway engineer condemned the ship canal as antiquated and doomed to be superseded by railways, suggesting a barge railway as preferable.

Mr. Edward P. North entered exhaustively into the question of rates, noting the rapid increase of railway facilities and the lack of corresponding improvements in the canal. He gave tables

⁶⁰ *Proceedings of the American Society of Civil Engineers*, Vol. XIV.

showing the great reduction in the cost of transportation year by year, by all routes, remarking that this was a great improvement over the one hundred dollars per ton charged from Albany to Buffalo before the completion of the canal. This apparent reduction, however, was partly attributable to the fact that the earlier figures were given in a fluctuating and depreciated currency, caused by the premium on gold, which later gradually lowered until it finally disappeared with the resumption of specie payment. Arguments were not required to show that the route by the lakes and Erie canal, though no longer the chief factor in the distribution of freight, was a controlling factor in the price received for that service. The grain product of thirteen states—from Buffalo to the Missouri—amounting to three hundred and fifty million bushels, would be affected by the cheapening of canal freights. The figures were from reports of the United States Department of Agriculture.

Mr. Willard S. Pope preferred making use of the Canadian system as being nearly three hundred miles shorter from Chicago to Liverpool and with less proportion of restricted waterway.

Mr. E. H. Walker was opposed to the proposed canal as being too expensive and too slow. Vessels of 75,000 to 90,000 bushels capacity would cost a hundred thousand dollars, would require a crew of twenty-five to thirty men, and the round trip from Buffalo east would require about a month. The slow speed required for such an expensive vessel and crew would not compare favorably with a one-quarter cent transfer charge at Buffalo. A ten-foot canal, with miter-sills as they were, locks lengthened, tumble-gates, steamboats of good model, costing fifteen thousand dollars, carrying eighteen or twenty thousand bushels of grain, using a crew of six men—such improvements to cost two or three million dollars, would be better.

Mr. W. W. Evans said that the railway grabbers knew and felt that as long as the Erie canal existed it would exert a very large influence on the cost of transport between the Atlantic coast and the great chain of lakes. No policy could be so suicidal as to sell or close it, and no policy could do as much good towards extending the wealth or influence of the State of New York as that of enlarging or improving this great water line, making it equal in carrying capacity to the Welland canal. A ten-mile

branch at Great Sodus bay to catch the Lake Ontario and the proposed Georgian Bay canal traffic was suggested.

Col. W. E. Merrill considered the plan entirely practicable from an engineering standpoint. The strong current at the western end, resulting from the effort to feed the entire length of canal from Lake Erie would be objectionable, but could be modified by retaining Eastern feeders and concreting leaky points. Lock gates, thirty-five feet wide by forty-five feet high for a twenty-five foot lift, would be feasible, but fixed dams in place of the movable type on the Mohawk would be preferable.

Mr. O. Chanute suggested relief by improving boat engines to obtain increased speed on the existing canal. Mr. T. C. Keefer approved the transfer at Buffalo to cheaper barges on the score of economy, and as following the Canadian practice at Prescott.

In traversing some of the foregoing objections, Mr. Sweet claimed in reply to Mr. Chanute that present canal-boats required one and one-fifth horse-power for a speed of one and one-third miles; that the horse-power required increased as the cube of the increase in speed. As to the argument that all canals must now yield to railways, he said that the rule, applicable to small canals with local traffic only, did not apply; railways had reached their limit of development as to gauge, and increased traffic meant more tracks and more trains. With canals the limitation was different. The ratio of resistance and of immersed surface to the amount of cargo decreases with increase in the tonnage of vessels, and consequently economy increases.

The time required to pass by a typical lake propeller, loaded with twenty-seven hundred tons, fitted with one thousand horse-power engines and drawing sixteen feet, was estimated at five miles per hour through two hundred and thirty miles of restricted prism west of Utica; allowing twenty minutes detention at each of eight locks, this would require forty-nine hours. From Utica to New York, two hundred and sixty miles, the river passage would permit a speed of ten miles per hour. Allowing ten hours detention at the locks of the Mohawk, this would make the time from Buffalo to New York eighty-five hours. This would be in effect to extend an arm of the sea nearly to the center of population of the whole country.

Other participants challenged the estimates of cost and placed the amount at two hundred and forty million.

The chief value of this discussion lies in the fact that it represented the most expert professional opinions of that day upon this important subject.

The net canal debt on September 30, 1884, was \$4,276,323.15; the gross tonnage for the year was 5,009,488, a decrease of 654,568. The West Shore railway opened for through traffic during the year, but notwithstanding this, railway tonnage also decreased. A restricted crop and less ample market were given as reasons. Only sixty boats were registered, of one hundred and sixty-six tons average tonnage.

By chapter 80, Laws of 1884, the Legislature appropriated \$30,000 to lengthen lock No. 50 near Syracuse "in such a manner as to allow the locking of two canal boats of the ordinary size of those running on the Erie canal, at one and the same time, one following the other, and upon such a plan as that while it [would] thus allow the passage of two boats at the same time, [would] also allow, if required, the passage of but one boat by the use of only the present existing lock." The work of construction was substantially done in the winter following the close of navigation. As this improvement was the initial experiment in the way of the lengthening of locks which afterwards took place, a brief explanation is necessary. The use of the double-boat system, or steamer and consort, had by this time become quite common. Canal officials had repeatedly called attention to the loss of time in locking boats through singly and had urged the adoption of quicker means of transportation in order to draw traffic back to the canal route. By lengthening the chamber sufficiently to permit the passage of the steamer and its consort at one lockage, without uncoupling, much time could be saved at each lock, the original lower gate being retained for use in locking a single boat through if required. Time saved meant lower canal freight rates and this in time meant increased traffic. Lock No. 50, at the eastern end of the Jordan summit level, on the middle division, was selected for the first lock to be lengthened, and the results were awaited by canal officials with considerable interest.

The question of insufficient water-supply for the canal, especially on the eastern and middle divisions, had engaged the attention of canal authorities and at this time seemed to be regarded as of vital importance. Various legislative committees had investigated the subject to a greater or less extent and had reported thereon. The enlargements of the canal, the lengthening of locks and other causes, required the use of more water to operate the canal. From denudation of forest lands upon water-sheds supplying canal feeders, from leakages, and more than all from the selfishness and greed of owners of antiquated leases and water-rights along the line, using more and more water for private purposes, the supply was year by year growing comparatively less until the required depth could scarcely be maintained throughout the season. Remedies had been persistently urged to remove the accumulated silt from the bottom and to deepen the prism another foot. But as one discerning official put it, the trouble was not at the bottom but at the top of the water. More water was needed and both the State Engineer and the Superintendent of Public Works urged⁶¹ the speedy building of additional storage reservoirs in the Adirondack region to provide an increased supply.

The annual message of Governor Hill, covering the period of 1885, is worthy of note from the fact that it did not contain a single word of direct reference to the canals. Other subjects seem to have engrossed public attention. The tonnage fell off about a quarter of a million from that of the previous year, by reason of lessened export demand. Navigation was open only two hundred and five days. The Comptroller, in his statement for the fiscal year to September 30, makes the net canal debt \$3,675,971.39.

The experiment of lengthening the berme lock at lock No. 50 to twice its original length, or to two hundred and twenty feet between quoins, leaving the lower gate intact, to be used as a middle gate in case of locking through a single boat, proved very satisfactory. Power derived from a water-wheel was also used in assisting boats through the lock. It was recommended⁶² that other locks, Nos. 47, 48, 49, 51 and 52,—all locking down west-

⁶¹ *Report of Superintendent of Public Works, 1884.*

⁶² *Report of State Engineer, 1885.*

ward, be improved in the same manner. It was also urged that the Forestport reservoir be speedily completed to increase the water-supply of the Rome level.

Many people believed that by reason of the commercial advantage and national importance of the Erie canal the Federal Government should bear a portion of the expense of increasing its capacity. Various measures to accomplish this result were advocated. In the Legislature a concurrent resolution was reported, asking the State's Representatives and Senators in Congress to support the Weber bill (H. R. 1577), then pending. This bill provided Federal aid to the State, to the extent of five million dollars in United States two and one-half per cent bonds, on condition that the State maintain a depth of nine feet in the canal, with locks of double length, and a free waterway to the commerce of the United States. The bill, however, did not become a law.

The total tonnage of canals in 1886 was 5,293,982, an increase of 562,198 over the previous year, which was attributed to the partial cessation of a railroad rate war, which permitted higher rates to be maintained and much traffic to be restored to the canals.

Navigation was open two hundred and fourteen days. Department reports contain little of interest for this period. It may be noted that the tendency was to cheapen transportation by quicker lockages and the use of three horses abreast on the tow-path.

The lengthening of lock No. 50 had proved so satisfactory that a similar improvement in other locks was deemed desirable. By chapter 646, Laws of 1886, the sum of two hundred thousand dollars was appropriated to double the length of the five other locks heretofore mentioned, and, after the season of 1886 closed, the work was carried to completion before the canal was opened in 1887. Guard-lock No. 1 was likewise improved.

During this latter year further lock improvements were authorized by legislative enactment. By chapter 113, Laws of 1887, fifteen other locks upon the Erie canal, eight of which were to be east of and the remaining seven west of Syracuse, were authorized to be similarly lengthened, \$375,000 being appropriated for the purpose. Chapter 463 of the same year also

appropriated \$28,000 for the lengthening of lock No. 72 at Buffalo.

The locks selected by the State Engineer and Superintendent of Public Works for improvement under this statute were Nos. 46, 45, 44, 35, 34, 33, 32 and 31, east of Syracuse, and Nos. 53, 54, 55, 56, 60, 61 and 62, besides the designated 72, west of Syracuse. These, together with the locks already lengthened, secured this improvement to the longest possible stretch of the canal. Contracts were let and work was pushed on them at once upon the close of navigation. On lock No. 46, at Utica, the canal authorities became involved in litigation with the Delaware, Lackawanna and Western Railroad Company and work was stopped thereon.

The net canal debt September 30, 1887, was \$2,583,121.16. The total tonnage for the year was 5,553,805. Navigation opened May 7 and closed December 1. The State Engineer urged the lengthening of the remaining canal-locks, except the flights at Lockport and Cohoes. Also the completion of the partly built reservoirs supplying the Syracuse-Utica long level with water. The duty of registering boats was transferred by chapter 528, Laws of 1887, from the Comptroller to the Superintendent of Public Works.

Governor Hill's fifth annual message, covering the period of 1888, was, like his previous messages, noteworthy by reason of the entire absence of direct reference to the canals, their history or their needs. Nor do the department reports contain much of general interest concerning that period.

The canals opened May 10 and nominally closed December 1, although the release of east-bound boats continued about two days longer, a period of two hundred and seven days. During the period of lock-lengthening the seasons of navigation were purposely made as short as practicable so as to allow the contractors all possible time for completing their work during the winter.

The total tonnage was but 4,492,948, a decrease which was substantially accounted for by the fact that before the opening of the season canal rates were held by the boatmen higher than shippers were willing to pay. While these rates were in abeyance, railroad agents were unusually active and secured the con-

tracts for carrying large quantities of grain, which would otherwise have been carried by the canals. Other influences were at work toward the same end—short crops, which caused a decrease in export trade, and a combination of traffic interests, which included the Union Steamboat Co. west of Buffalo, the Erie Elevator Co. at Buffalo, and the Erie Railway to New York. The so-called "Hutchinson" wheat corner, a gigantic speculative deal of the time, also retarded shipments. The building of new boats was also inactive, only eighty-five being registered. The net canal debt at the end of September, 1888, was \$2,066,370.61.

The locks lengthened under the statute of 1887 were completed before the opening of navigation in 1888, except No. 46, upon which work was not resumed, the injunction thereon not having been set aside. By chapter 416, Laws of 1888, passed May 28, \$200,000 was appropriated to lengthen additional locks upon the Erie canal in a similar manner. Five or more of these locks were to be east and two or more west of Syracuse. This statute also carried an additional appropriation of \$100,000 with which the Superintendent of Public Works was authorized to deepen the Erie canal by removing the accumulations of dirt from the bottom wherever in his judgment the interests of commerce demanded it, and to restore the waterway to its standard depth of seven feet. The locks to be improved under this statute were to be designated by the State Engineer and the Superintendent of Public Works, so as most to facilitate and improve navigation, and numbers 26, 27, 28, 29, 30, 63 and 64 were so designated. But the estimates of cost were later found to exceed the amount of appropriation and it was decided to exclude number 26 from the list. Work on the other six was undertaken and pushed to completion after the close of navigation.

In attempting the work of deepening and cleaning out the bottom of the canal to a standard seven-foot depth under the special appropriation for that purpose, serious difficulties were encountered. The statute required it to be done by contract. It became evident upon investigation by the engineers that the removal of quicksand, clay, loam, hardpan and other changeable materials, found at various points, would endanger the walls and do more harm than good. The appropriation, therefore, was not used, pending a more complete examination by the

engineers during the following spring, and it was sought to have the statute so amended that the work could be done directly under supervision of the Department of Public Works.⁶³

The question of water-supply for the middle division of the canal, which was to a great extent secured from the head waters of the Black river, through the feeder at Booneville and thence by the Black River canal to the Erie, was a subject of prominence. The State Engineer caused careful investigation of the history and locality of this source of water-supply to be made during the year 1888 with special reference to the increase of supply and to the claims of mill owners and others interested. As a result of this investigation, in his following report⁶⁴ there was presented an interesting and elaborate history of the subject. As a conclusion he urged the raising or completion of the Forestport dam from fifteen feet to its originally-planned height of twenty-one feet, to insure an adequate reserve of water-supply, both to the canal and the interested mill owners. Sixty thousand dollars was named as the estimate of cost.

Claims for damages by reason of leakage from the Erie canal at various points, largely caused from its location and construction during the period of its first enlargement (1836-62) along side-hills and through gravelly or porous soils, had become so numerous and such a never-ending source of loss to the State that the Superintendent of Public Works urged a special appropriation of \$20,000 for drainage improvements to mitigate if not abolish this evil.⁶⁵

By chapter 240, Laws of 1889, \$20,000 was appropriated to be expended by the Superintendent of Public Works in properly ditching to carry off canal leakage where necessary to protect the rights of property owners.

Also by chapter 274 of that session \$45,000 was appropriated to complete the construction of a storage reservoir above the Forestport pond by a dam not to exceed twenty feet in height.

The canal was open for navigation May 1, and closed December 1, 1889. The number of new boats registered in 1889 was fifty-eight. It may be noted, however, that with increased facili-

⁶³ *Report of Superintendent of Public Works, 1888.*

⁶⁴ *Report of State Engineer, 1888.*

⁶⁵ *Report of Superintendent of Public Works, 1888.*

ties for speed on the canal and the preponderance of through grain traffic much larger boats were the rule. The average tonnage of new boats for the period of four years ending with 1889 was two hundred and thirteen, while for the period of four years prior thereto and ending with 1885, it was one hundred and fifty-five tons.⁶⁶

The whole number of bushels of grain of all kinds delivered in New York from May 1 to December 1, 1888 (canal navigation season), was about 75,000,000, of which the New York Central and Erie railways each carried about 11,000,000, the West Shore railway about 7,000,000, and the canal about 33,000,000.

The total canal tonnage for 1889 was 5,370,369, an increase over the previous year of 427,421, and an increase over the average of the past five years of about one-quarter of a million tons. The total number of bushels of grain of all kinds shipped by canal from Buffalo in 1889 was 41,985,824.

The Legislature of 1889 was active in making appropriations for improvements. By chapter 54, Laws of 1889, \$10,144.61 was appropriated as an additional sum to complete the lock improvements on the Erie canal, authorized by chapter 113, Laws of 1887, and by chapter 493, an unexpended balance of \$1,961.64 under the last named statute was reappropriated for the same purpose. Chapter 110, section 2, conferred the necessary authority upon the Superintendent of Public Works to expend the fund for deepening and cleaning out the canal under the previous year's appropriation, either by contract or otherwise, as he might determine to be for the best interests of the State, in compliance with the request contained in his report. For the completion of the improvement on lock No. 72, \$2,055.51 was appropriated by chapter 70, in addition to the \$28,000 previously granted by chapter 463, Laws of 1887.

Further improvements in the lengthening of locks were provided for by chapter 568, Laws of 1889. The Superintendent of Public Works was directed to lengthen one tier of eight or more locks on the Erie canal during the ensuing winter, the locks to be selected by the State Engineer and himself so as to best protect and most facilitate and improve navigation, \$215,000 being allowed for this purpose. He was also directed to deepen the

⁶⁶*Report of Superintendent of Public Works. Tonnage Report, 1889.*

prism to the standard of seven feet of water, \$120,000 being allowed for this, but, at his discretion, he might use \$8,000 of this sum for lock machinery to complete lengthened locks on the western division. The lock-lengthening was to be done by contract, the deepening, whether by contract or day labor, was discretionary, and any surplus of the lengthening fund might be used for deepening.

Lock 46 was not advanced during 1889. The following locks were placed under contract: numbers 23, 24, 25, 26, 65 and 66. These six locks consumed so much of the appropriation that the other two authorized were not designated. Since 1886 twenty-seven locks had been lengthened, and seven more (including lock No. 46) were under contract. When these were finished, three hundred and fourteen miles of canal could be used by double-headers without uncoupling. The remaining locks were near Cohoes, at Little Falls, Newark and Lockport, where the problem of lengthening certain locks involved difficult questions that could not be solved by the ordinary plan of lengthening.⁶⁷

Under chapter 110, Laws of 1889, amending chapter 416, Laws of 1888, permitting the canal to be "bottomed out" by day labor, a large force of men was employed as soon as the law became operative on April 6, and between that date and the opening of navigation on May 1, about one hundred miles of canal were cleaned out.

In 1889 a revision of former estimates and surveys was made by Captain Carl. F. Palfrey, Corps of Engineers, U. S. A., for a twenty-one foot canal on two routes from Lake Ontario to Niagara river and published, with profiles and estimates, as part of the report of the Chief of Engineers, U. S. A., for 1889, at page 2434. In the same year a bill was introduced in Congress by Representative Sereno E. Payne, as H. R. No. 582, 51st Congress, first session, under date of December 18, providing for a commission to select one of these routes and appropriating one million dollars for construction upon it. No action was taken by Congress.⁶⁸

As showing the policy of the State to discourage private enterprise that interfered with the public welfare, the following inci-

⁶⁷ *Report of State Engineer, 1889.*

⁶⁸ *Report on Barge Canal, p. 975. (Albany, 1901.)*

dent is given. A Senate bill directing the construction of a sewer under the canal at Utica was returned by the Governor without approval on the principal ground that it was solely for the benefit of the City of Utica and of no benefit to the canal or the State at large."

Improvements in appliances for making quicker lockages still occupied the attention of the authorities. Without the aid of machinery it was difficult to get an ascending "double-header" into a lock. A turbine wheel, set in the well at the head of the lock and discharging through the culvert under the central pier wall, operated rope cables which, passing over spools, were used to haul the boats into and out of the lock. Wire cables had been tried but proved unsatisfactory, as they were heavy to overhaul, wore rapidly and broke easily. Iron frames were also substituted for timber frames. These were neat, strong, worked well and saved much time, both in hauling in and starting out boats. Friction brakes were also used. It was considered noteworthy that in 1888, lock No. 54 was passed in nine minutes and forty seconds, and lock No. 56 in ten minutes, by the aid of machinery. It was computed that by using a twenty-two inch turbine wheel with six-inch buckets, 5,406 cubic feet of water would be required for operation, developing 8.18 horse-power.

Interesting experiments were also made under the direction of the Superintendent of Public Works to determine how best to increase the speed of boats passing down the locks, by opening one or more of the paddle valves in the gates, thus creating a current to aid in drawing boats into the locks and in flushing them out. Deputy State Engineer, Arthur S. C. Wurtele, made various deductions from the experiment; among them, that it was most advantageous to use only one paddle for drawing in, as the use of more would render the boat liable to damage the gates and coping, while for "swelling out" the use of two paddles was advised. In drawing water through the valves, the velocity was taken as proportional to the square root of the lift, the velocity in chamber as proportional to the relative area of the paddles used and the chamber, and the velocity of the boat as inversely to these proportions, so that the time of entry would be the same for all lifts, while the time of leaving would vary.

"Senate Documents, 1889, No. 48.

The average time for drawing in with one paddle was two minutes and fifty-two seconds, and the average time of swelling out with two paddles was two minutes and fifty seconds. Taking an average lift of nine feet, and considering the time of emptying the lock as proportional to the square root of the lift, it was found that the lockage could be made in eight minutes. The total amount of water used in a nine-foot lock, with a normal capacity of 18,597 cubic feet, was computed at 97,876 cubic feet. As the time of lockage without the use of this method was estimated at about twenty-seven minutes, there was a clear gain of about twenty minutes to each lock, or twenty-four hours on the seventy-two locks of the Erie canal.⁷⁰

But as against this advantage in time there should be noted the enormous amount of additional water required for lockages, in view of the difficulty which had already menaced the canal from the frequent scarcity of water, especially on the high levels of the eastern division.

In 1889 an exceptionally quick trip was made by the steamer Cortez, loaded with 6,500 bushels of wheat. This was the last boat to leave Buffalo for tide-water, and make the trip in the net time of four days, ten and one-half hours.

Widening the tow-path to eighteen feet was decided to be a necessary measure. Triple teams, drawing double-headers, were the rule and that width was necessary to enable two such teams to pass.⁷¹

Replying to another Senate resolution of inquiry in relation to the waters of Skaneateles lake, which were then being used by the State for the Erie canal, State Engineer John Bogart estimated the cost of providing the amount of water required for the Jordan level, if the supply from Skaneateles lake were cut off, at, approximately, \$1,325,000. The inquiry was prompted by the desire of the City of Syracuse to divert the supply from the lake for municipal purposes.

Under the legislative grant in chapter 291, Laws of 1889, application was made by the city water commissioners to the canal board for the use of the water. After protracted hearings, consent was refused, but later their engineers, with a representative

⁷⁰*Report of State Engineer, 1889.*

⁷¹*Communication from State Engineer to Senate, March 18, 1889.*

of the State Engineer's department, made a survey of the watershed in question.

Chapters 476 and 493, Laws of 1889, reappropriated a balance from chapter 424, Laws of 1887, and \$3,000 for the improvement of Oak Orchard feeder. Chapter 141, Laws of 1889, amended the penal code as to adulterations, restricting the sale of ice cut from the canal, to use only for cooling beer in kegs and to be conspicuously labeled "Canal Ice."

The net canal debt on September 30, 1889, after deducting sinking-fund balances, was \$1,585,534.66. Chapter 380, Laws of 1889, became operative on June 6, making \$2.00 per day the minimum wages on all public works. This obliged officials to lay off many men during the summer so as to keep within the appropriations and in other ways the law hampered the progress of work.

The net canal debt September 30, 1890, was \$1,177,887.51. The total tonnage for 1890 was 5,246,102, a slight decrease from the previous year, due to deficiency in amount of grain carried. Of this total tonnage the Erie carried 3,303,929. Of the total amount of all grain receipts at New York the canals carried 30,082,900 bushels, or 38.72 per cent, leaving to be carried by all other routes 47,619,256 bushels.

The season of navigation opened April 28 and closed December 1. The total number of boats on the registry list at the opening of the year was five thousand three hundred and sixty, to which were added seventy-seven new boats registered during the year.

In 1890 a report, with maps, profiles and revised estimates, was made by William Pierson Judson and was published as part of H. R. No. 283, 52nd Congress, 1st Session, 1892, and as part of Senate resolution of the 54th Congress, 1st Session, 1896, and was also published separately under title of "From the West and Northwest to the Sea, by way of the Niagara Ship Canal." These estimates were for two routes from Lake Ontario to Niagara river and for twenty-one feet depth of water. Reports were also made to Congress in 1890 by Representative Sereno E. Payne, and in 1892 by representative C. A. Bentley, and in 1896 by Representative C. A. Chickering and by Senator Calvin S. Brice, in each of which the commercial and engineering aspects of the case were fully presented and favorably discussed.⁷¹

⁷¹ *Report on Barge Canal*, pp. 975-976.

Chapter 314, Laws of 1890, approved May 9, entitled "An Act to Establish and Maintain a Water Department in the City of Syracuse," conferred upon the Syracuse water board the right to take water from Skaneateles lake in a thirty-inch pipe, provided that the board should first increase the storage capacity of the lake sufficiently to store all the ordinary flow of its watershed, the State reserving the first right to use a sufficient quantity for all the requirements of the Erie canal, the rights of the city to be subject to the superior claims of the State.

By chapter 168, Laws of 1890, appropriations were again provided to facilitate commerce by increasing and improving the lockage capacity and depth of the canal. Before the opening of navigation, in 1891, the Superintendent of Public Works was authorized and directed to lengthen one tier of six or more additional locks, to be designated, as before, by himself and the State Engineer "so as best to protect and most facilitate and improve navigation in said canal." One hundred and eighty-five thousand dollars was to be used for lock-lengthening and machinery, and one hundred thousand together with any unused balance of the lock fund, was available for cleaning out and deepening the prism to standard dimensions.

The principal improvement during the winter of 1889-90 was the continuation of lock-lengthening and restoration of the canal prism under the provisions of this statute. Locks Nos. 23, 24, 25, 26, 65 and 66 were so completed. This improvement increased the mileage which could be used for double-headers, without uncoupling, to about three hundred and fifteen, leaving thirty-seven miles still unimproved.

In 1890 an interesting report⁷² was rendered of a survey that was made during the summer of 1889, under a Senate resolution of that year. This survey was made to determine the feasibility of establishing storage reservoirs in the valley of the upper Genesee for the use of the canals. The report stated that before the completion of the Erie canal, and during the period from 1822 to 1825, the Genesee river was the sole source of supply for the canal as far east as the Seneca river, sixty miles. The Genesee river feeder was located by engineer Canvass White in

⁷²*Report of State Engineer, 1890.*

1819 and was in later years constructed. After the "Stop law" of 1842 a dam eighteen inches high, built across the river one and one-half miles above Rochester to supply the feeder, was destroyed by the sheriff as a nuisance. Later it was restored and used. Since the completion of the canal, Lake Erie has supplied the western levels, but water from the Genesee river has been used as a reserve supply to be used more or less each year as the exigencies of navigation required.

That portion of the valley lying between the falls of Portageville and Mt. Morris, for a distance of about twenty-five miles, was carefully examined by George I. Bailey, assistant engineer, and party and found to be peculiarly adapted to the purposes of a storage reservoir. The river at that point flows between precipitous bluffs of shaly rock, clay and sandstone, the escarpments being from three hundred to five hundred feet high and from one-eighth to one-fourth mile apart. At Mt. Morris occurs the lower end of this remarkable gorge or canyon of the Genesee. The flow of the river is variable, so that storage is necessary to provide an even supply. The State Engineer reported that it would be of advantage to have a reserve supply of perhaps fifteen hundred million cubic feet, available at the rate of thirty-eight thousand cubic feet per minute. This quantity would probably suffice for all canal purposes.

There was found to be practically no limit to the height of dam which could be constructed, and computations were made to one hundred and seventy-five feet. It was estimated, however, that a dam built with a crest fifty-eight feet above the river surface and at a cost of one million dollars, would provide for the amount of water above stated and would flood about fourteen hundred acres of territory. A suitable foundation of Genesee slate rock was located at an average depth of seventeen feet below the surface of the river. Investigations as to rainfall showed that the watershed would afford a maximum supply of nine hundred and fifty-eight cubic feet per second for every day in the year, and this volume would require a dam of one hundred and seventy-two feet in height. The reservoir would be of importance to the canals for quick filling in the spring, for emergencies and to compensate the Lake Erie supply for retardation by eel grass, evaporation and leakage.

Navigation was opened May 5, closing December 5, 1891. Lake Erie was open April 13, and the Hudson river from March 24 to December 24.

During the winter of 1890-91, locks Nos. 40, 41, 42 and 43 were lengthened to correspond with the general scheme, as was also lock No. 46 at Utica. It will be recalled that the contract for this lock had been let in 1887, but the Delaware, Lackawanna and Western Railroad Company had obtained an injunction restraining the contractors from proceeding with the work on the ground that the new structure would render the Company's swing-bridge at the foot of the lock useless, as the plans provided for lengthening at the foot. Finally the railroad company agreed to pay to the State the additional cost of lengthening at the head, and the contractors were ordered to proceed. Upon their refusal to begin under such terms as the State would accept, their contract was canceled and the work was relet on July 8, 1890, and completed ready for navigation the next spring.

The work of lengthening locks upon the canals, which began in 1884 and had been continued each year, was suspended during the winter of 1891-92, owing to the failure of the Legislature of 1891 to grant the necessary appropriation for that purpose. The whole number of locks lengthened on the Erie, up to that time, was thirty-eight, as follows: Nos. 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 60, 61, 62, 63, 64, 65, 66 and 72, leaving thirty-four unimproved. Sixteen of these were at Cohoes (Nos. 3 to 18), having short levels between, averaging one thousand feet and on curves so sharp as to be difficult to adapt to the use of double boats. Five others were the combined locks at Lockport which would be expensive to change; of the remainder, two were at Albany, four above Cohoes, four at Little Falls and three at Newark; all could be changed but at considerable expense. The mileage covered by these improvements was about three hundred and twenty-three, leaving nearly twenty-nine miles unimproved.⁷³

During the legislative session of 1891 political complications arose which blocked the passage of appropriations, but the Legislature evinced a well-defined mood for investigations. Inquiry

⁷³ *Report of State Engineer, 1891.*

by a Senate resolution was made of the Superintendent of Public Works as to the reasons for the increased cost of maintaining the canals for the previous period of seven years. In reply the Superintendent explained⁷⁴ that the apparent increase was due to the system of lock-lengthening—then nearly completed—and that, aside from this item, the cost of lock-tending and ordinary repairs had remained nearly stationary for the seven years in question, at the sum of six hundred and seventy thousand dollars.

The Assembly, by resolution on April 28, 1891, appointed a committee of seven to investigate as to the management of the canals for the preceding eleven years. The committee held sessions during the year and on February 24, 1892, they reported⁷⁵ that not a dollar had been unnecessarily appropriated or otherwise than carefully expended; that the letting of contracts was in no wise dependent upon political affiliations, and that no contractor had contributed to either political party by reason of his connection with the canals.

In response to a Senate resolution of inquiry, the State Engineer submitted a list⁷⁶ of canal bridges built by the State under special laws, since 1854, at points where no bridges existed prior to the passage of the law of 1854 upon that subject.

Chapter 366, Laws of 1891, provided that no more bridges over the canals should be built or reconstructed by the State except where the canal obstructed a road in use before the canal was built, and then only at a cost sufficient to preserve the continuity of the street or road. If more costly bridges were desired the local authorities must pay the additional expense by agreement with the Superintendent of Public Works.

On March 24 the State Engineer and Superintendent of Public Works jointly warned the Senate of the dangerous condition of the great canal aqueducts (lower and upper Mohawk and Schoharie) and asked an appropriation of fifty thousand dollars to make them safe.

The warning seems to have been unheeded, for in his next annual report⁷⁷ the Superintendent says: "As a result, the only

⁷⁴*Senate Documents*, 1891, No. 52.

⁷⁵*Assembly Documents*, 1892, No. 57.

⁷⁶*Senate Documents*, 1891, No. 50.

⁷⁷*Report of Superintendent of Public Works*, 1891, p. 14.

obstructions to navigation during the past season [1891] were those caused by the giving way of these aqueducts in three different places."

In 1891 Dr. E. L. Corthell, on April 8, read before the Western Society of Civil Engineers at Chicago, a paper entitled "An Enlarged Waterway Between the Great Lakes and the Atlantic Seaboard," in which was given a summary of the routes and projects. This was published in the *Journal of the Association of Engineering Societies* for April, 1891, and was discussed at some length in the same issue by Messrs. Onward Bates, St. John V. Day, Charles D. Marx and Benzette Williams and also in the December issue by Messrs. Wm. Pierson Judson, J. M. Goodwin and Samuel McElroy.⁷⁸

The gross tonnage of the canals for 1891 was 4,563,472, of which the Erie carried 3,097,853, an apparent decrease of 682,630, but an unusual tonnage of ice which had been transported from Lake Champlain in 1890, amounting to 467,537 tons, if deducted, would leave the probable real deficit as 215,093 tons. The cause of this deficit was alleged to be the lack of State provision for canal development and quicker transportation to compete with the increasing facilities of the railways. During the season a violent and persistent rate war existed between the canal interests and the combined railways and at once on the close of navigation railway rates doubled.⁷⁹

The cost of moving freight per ton-mile upon the canal had been gradually reduced from 1.526 in 1872 to 0.645 cents, about \$114,000. And if, as Governor Flower hopefully remarked in his message of the ensuing year, there should be sufficient revenues from the canal fund to meet it, "the State has levied its last tax for the payment of the canal debt."

Governor Hill, in a communication⁸⁰ to the Legislature on April 10, 1891, recommended the application of certain unappropriated money then in the treasury, the result of a refund of the United States direct tax, to the extinguishment of the remaining State debt, including the canal debt. The message does not appear to have been acted upon.

⁷⁸ *Report of Barge Canal*, p. 981.

⁷⁹ *Report of Superintendent of Public Works*, 1891, p. 19.

⁸⁰ *Senate Documents*, 1891, No. 71.

Owing to extremely low water in Lake Erie in 1891, caused by a remarkably dry season and continued northwest winds, it became difficult to preserve the necessary depth of water on the Tonawanda creek and Lockport level. The gates of lock No. 72 at Black Rock were kept open most of the season, although it was very unusual to open them at all.

In reporting to the Legislature of 1892, both the State Engineer and the Superintendent of Public Works urged the necessity for better and more canal improvements, the former presenting an elaborate review of the methods and cost of steam towage as being the only remunerative method of canal transportation at this time.

A legislative joint resolution⁵¹ authorized the Governor to appoint three commissioners to investigate and report what measures were expedient to carry into effect the suggestions and conclusions of the special report of the State Engineer as to supplying water from the Genesee river to the canal. Evan Thomas, John Bogart and Charles McLouth were so appointed.

In February of 1892, the subject of ship canals across the State of New York, including both the Ontario and Erie routes, was under consideration by Congress. Major D. C. Kingman, Corps of Engineers, U. S. A., presented a general statement of the plans and estimates which had been made up to date, and of the present conditions and cost. This statement, with a full discussion of the commercial aspect of the case was published as a part of H. R. No. 423, 54th Congress, 1st Session, 1892.⁵²

Legislative appropriations for sundry minor canal improvements were granted but none for continuing the system of lock-lengthening. One act of the Legislature of 1892, is noteworthy by reason of its far-reaching consequences in shaping the future policy of canal improvement. By chapter 378, the Legislature provided for the election, in February, 1893, of delegates to a Constitutional Convention to be held in May of 1893, one of its duties being the consideration of amendments relating to the care and improvement of the canals of the state. However, on January 27, 1893, before the time fixed for the elec-

⁵¹ *Senate Documents*, 1892. No. 48.

⁵² *Report on Barge Canal*, p. 972. (Albany. 1901.)

tion of these delegates, the law of 1892 was amended so that the delegates should be elected at the November election of 1893 and the Convention should assemble in May of 1894. At the ensuing November election delegates were so chosen.

The failure of the Legislatures of 1891 and 1892 to continue the policy of improvement which had been in force since 1884, can not be viewed as indicating a radical change of public sentiment. The lack of funds in 1891 was chargeable to the political deadlock of that year, and the act carrying appropriations the next year, although passing the Legislature, failed to receive the Governor's approval, because certain objectionable features were included and the act was so framed that it could not be vetoed in part.

The Legislature of 1893 again took up the work of lock-lengthening and bottoming out, in a very limited degree, but the subject of any general improvement was held in abeyance, pending the action of the Constitutional Convention. Following its suggestion, the State entered upon the project of deepening the canal to nine feet, which was not completed before there was vigorously agitated the scheme, which has culminated in beginning a thousand-ton Barge canal. The whole history of the canal has been one of gradual development, but the present phase may be dated from about 1884, when a period of improvement was begun which has extended to the present—a period during which the need of some adequate means of controlling railway competition could not be satisfied till a radical change of plan was adopted.

Of the minor canal appropriations of 1892, the following may be noted: Chapter 494 appropriated \$35,000 to complete the reservoir above Forestport pond and \$14,000 additional to change adjacent highways submerged thereby. By the close of the season the work had been placed under contract and was well under way. Chapter 476 appropriated \$20,000 to remove rocks and obstructions from the canal prism between Commercial and Ferry streets in Buffalo. Chapter 495 appropriated \$20,000 to strengthen and protect the berme bank of the canal at Schenectady. Plans were prepared for continuing the stone wall for twenty-three hundred and forty feet. Chapter 471 appropriated \$17,000 to be expended upon betterments to certain Madison

county reservoirs. An amendment by chapter 274 to section 3 of chapter 412, Laws of 1864, providing for the annual filing of chattel mortgages upon canal-boats, should be noted. Chapter 480 appropriated \$15,000 for the purpose of constructing a stone dam to take the place of the old timber dam at Little Falls across the Mohawk river. At the close of the year construction was under way.

Navigation upon the canal for 1892 opened on May 1 and closed on December 5, a period of two hundred and nineteen days. Lake Erie was open April 14. The Hudson river was open from April 1 to December 22. The total tonnage of the canals for the year was 4,281,995, showing a decrease of 281,477 tons. As a cause for this falling off, the Governor in his next message³³ stated that the competing railways had advanced their equipment to a point where they could transport freight as cheaply as the canals. The remedy proposed was more rapid transit, and a plan for doubling the rate of speed by the use of electric power for propulsion was suggested. This power was to be generated by the use of waste water at the locks and should be furnished to boatmen at a rate not to exceed sixty cents per day, per boat. The expense of maintenance for the year was the lowest since 1886 and the management was asserted to be honest, prudent and efficient.

Ordinary repairs and maintenance cost \$737,051.63, largely owing to the fact that no breaks occurred. Of the above total tonnage the Erie canal carried 2,978,832 tons. The total grain received at New York by all routes from May 1 to December 1, was 110,024,317 bushels, of which the canals brought 25,496,287 bushels or 23.17 per cent. Of the railways, the New York Central showed a gain of 4,100,176 and the Erie 995,576 tons for the year. There were thirty-five boats registered in 1892, having an average tonnage of two hundred and eleven. Owing to abundant rainfall this year, more care was required to guard against too much water on the middle division levels than the usual anxiety to obtain enough.

In his annual report³⁴ for 1892, State Engineer Martin Schenck called the attention of the Legislature to the resolutions adopted

³³ *Governor's Annual Message*, 1893.

³⁴ *Assembly Documents*, 1893, No. 35.

by the canal convention held in Buffalo during October of that year and advocated in accordance therewith the making of a survey and estimates for increasing the depth of water in the canal prism to nine feet, except at aqueducts and locks. He again urged the thorough repair of the great aqueducts for the safety of navigation, and further lock improvements, including the two locks between Cohoes and the upper Mohawk aqueduct and another one mile east of Little Falls.

He said that a measure was then pending before Congress to appropriate one hundred thousand dollars for making a survey for a ship canal from the Hudson river to the Great Lakes, and he endorsed this survey for the information it would furnish, but declared that, as a completed work, such a canal was neither feasible nor was its completion to be expected. The ocean steamer with her tremendous height and bulk would never with any degree of economy pass through a canal three hundred miles in length, nor would any number of the existing lake steamers carry grain to Europe.

"The practical canal of the future, connecting Lake Erie and the Hudson river," said the State Engineer, "ought to be one capable of bearing barges two hundred and fifty feet in length by twenty-five feet breadth of beam, of a draft not to exceed ten feet and of such a height that the great majority of bridges that should span this canal might be fixed structures instead of draw-bridges." With this proposed canal (which could be built for a reasonable sum), bearing barges towed in fleets, each boat carrying fifty thousand bushels of wheat, New York would be enabled to hold her commercial supremacy against all comers for many years to come.

This appears to have been the first official presentation of what is practically the present thousand-ton Barge canal.

Prior to this time many thousands of dollars from the ordinary canal repair fund of the eastern division had at times been expended on dredging and cleaning out the silt and sewerage deposits from the Albany basin. A Court of Appeals decision that the Albany basin—though State property—was no intrinsic part of the canal system was noted by the State Engineer in his report. The decision⁸⁵ was to the effect that the common council

⁸⁵ 3 Paige 213, affirmed 9 Wendell 571. 23 Barber 33, affirmed 26 N. Y. 472.

of Albany have the same general jurisdiction over the pier and basin and to the same extent as over any other part of its chartered limits, subject to such of the provisions of the act for the construction of the Albany basin as are inconsistent therewith.

For the repair of the aqueducts, which had been urged by State officials in previous years, the Legislature (chapter 5, Laws of 1893) appropriated \$75,000 to build or repair portions of the trunks at Schoharie, upper and lower Mohawk and to make such repairs to the masonry as might be needed for their preservation. During the following winter they were placed in substantial condition.

In addition the Legislature of 1893 appropriated several hundred thousand dollars by special statutes for sundry canal improvements, including the lengthening of lock No. 19, \$38,000 (chapter 119); deepening or bottoming out the canal and repairing certain structures, as designated by the State Engineer and Superintendent of Public Works, including the cleaning out of the Rocky Rift feeder, \$50,000 (chapter 119); deepening and improving the Erie basin and Black Rock harbor, \$10,000 (chapter 119); deepening the Erie canal in the city of Buffalo, \$10,000 (chapter 119); cleaning out Oak Orchard creek and feeder, \$35,000 (chapter 136); extending a culvert for sewerage at Canastota, provided that in the judgment of the Superintendent a legal or equitable obligation to do so existed, \$7,000 (chapter 328); cleaning out the State ditch at Liverpool, \$5,000; improving Butternut creek, \$9,000; ditching to protect private property from damage by leakage from canals, \$20,000 (chapter 119); repairing the Mohawk dam at Cohoes, \$90,000 (chapter 643); and for improving various feeders and reservoirs, building canal walls and numerous swing or lift-bridges in the various cities on the canal, most of the latter, however, being built under agreements by which the cost was partly borne by the municipality benefited.

The reconstruction of the Buffalo bridges and the one at Clinton street, Syracuse, was mostly completed during the year; the appropriation for drainage was partly expended; lock No. 19 was under contract, and the improvements at Black Rock, deepening the canal in Buffalo and the improvements at Erie basin

and in Buffalo harbor were in progress during the year. The channel at Black Rock was deepened to twelve feet by fifty feet in width and at Erie basin to eighteen feet deep by one hundred feet wide, being mostly subaqueous rock excavation and made necessary by the increase of commerce, at the port of Buffalo. The stone dam across the Mohawk river at Little Falls was also completed.

Chapter 405, Laws of 1893, provided another amendment as to filing chattel mortgages upon canal-boats whereby a renewal must be filed annually within thirty days next preceding their expiration, in order to continue valid as against creditors or subsequent purchasers or mortgagees in good faith.

Chapter 119, Laws of 1893, appropriated ten thousand dollars for the purpose of making experiments on the electrical propulsion of boats. During the summer, in connection with the Westinghouse Company, some experiments were made in the vicinity of Rochester, using the boat F. W. Hawley fitted with appliances for use with a trolley system. The electrical expert employed by the State deduced from the experiments that the cost of electrical propulsion would be under ten cents per mile at a speed of three and one-half miles per hour, with double-headers. With better conditions the cost could be reduced to five cents per mile.

On February 2, 1893, the commissioners of the Genesee valley storage reservoir project reported strongly in its favor. Chapter 726, Laws of 1893, appropriated ten thousand dollars for determining the feasibility and desirability of carrying out the commissioners' plan as reported. Another engineering survey was organized under George W. Rafter, in pursuance of this law, to make a further critical examination of conditions.

Canal navigation in 1893 opened May 3 and closed November 30. River navigation was also shorter than usual—from April 1 to December 6. The lake at Buffalo was open from April 15. The number of boats registered was sixty-two, of which fifty were of two hundred and fifty tons each, the average, however, being but two hundred and thirty-one tons.

Only \$150,000 of the canal debt remained at the beginning of the year, due in October, for which payment from the canal fund was already provided, besides leaving an estimated \$30,000

therein. The Comptroller's statement covering the fiscal year closing September 30, 1893, shows an outstanding indebtedness of \$60,271.70, including certificates of \$660, not presented for redemption, against which there were sinking-fund balances on hand.

The season of 1893 was an unusually prosperous one. The total canal tonnage was 4,331,963, an increase of 49,968 tons. On the Erie canal alone the increase was 256,894 tons, the total tonnage being 3,235,726. During the navigation season the total receipts of grain at the port of New York was 108,962,706, of which the canals carried 43,076,900, or more than thirty-nine and one-half per cent. The increase was attributed to higher railroad freight rates which turned traffic to the canals and made the season a prosperous one for boat owners. There was, however, but a slight increase in the cost of grain carrying, perhaps one-fourth of a cent per bushel. The cost of ordinary repairs and maintenance was \$726,087.47, the lowest for seven years past.⁸⁶

With the beginning of 1894, Governor Flower called the attention of the Legislature to the necessity of maintaining the supremacy of the canals and, among the various methods of increasing their efficiency, strongly advocated the use of electricity as a means of propulsion.⁸⁷

The other State officials also joined in urging extensive and immediate improvements. One of the most feasible plans in the way of economical construction was to deepen the water to nine feet by raising the banks one foot and excavating the bottom an equal amount, except at locks and aqueducts, where eight feet of water was deemed sufficient. This plan included the completion of the system of lengthened locks and the use of "double-header" boats. The State Engineer again recommended an appropriation for a survey and estimates for this purpose. He also urged the retention of State ownership of the canals, saying that the center of political power, once vested in the Empire State, had long since passed on to the west. Who could say that the future interests of those sections might not be the means of defeating measures absolutely necessary to canal maintenance and of our commercial supremacy?

⁸⁶ *Governor's Annual Message*, 1894.

⁸⁷ *Id.*

The lengthening of lock No. 20 and a change of alignment, together with the substitution of two twelve-foot lifts in place of the existing three eight-foot locks at Newark was advised. The pending ship canal project, again before Congress, was strongly advocated, not from the apprehension of its actual construction for many years to come, but for the enormous amount of engineering information to be gained by the survey.

The State Engineer again advocated the project for a barge canal one hundred feet in width, with twelve feet of water, capable of bearing boats containing fifty thousand bushels of wheat from Buffalo to New York at two cents per bushel, with profit. The proposed route substantially followed the line of the Erie canal, using hydraulic lifts in pairs in place of the flights of locks then in use. The estimated cost of the plan, using available old material, should not exceed twenty-five million dollars.

Of the old bench walls on the middle division, which had given so much trouble, some ten and one-half miles still remained. The State Engineer advised the replacing of these by walls extending to the bottom of the canal and that an annual appropriation of about fifty thousand dollars for three years would cover the expense.⁸⁸

The Legislature of 1894 was evidently favorably impressed by these views, for by chapter 572 it authorized the expenditure of forty thousand dollars to lengthen lock No. 20. Also one hundred thousand dollars to begin the scheme of deepening the canal to nine feet of water at such points, to be selected by the State Engineer and Superintendent of Public Works, as would eventually secure a nine-foot channel throughout the canal, either by raising the banks or deepening the bottom. This was a modification of the "Seymour plan" previously referred to.

Since 1829 some half a hundred different laws had been enacted relating to the administration of the canals of the state. Complaints had been received from subordinate officials that some of their provisions were conflicting and ambiguous, rendering it extremely difficult for canal employees and others interested to ascertain just what their duties were. To avoid misunderstandings, it was deemed advisable to have the entire body of canal administrative law rearranged, simplified and codified, and

⁸⁸ *Report of State Engineer, 1893.*

on April 20, 1894, an act (chapter 338) providing for the administrative control and maintenance of the canals, to be known as the "Canal Law" and as chapter 13, General Laws, went into effect.

Liberal special appropriations were again made by the Legislature, among them being thirty-five thousand dollars to build berme walls or embankments at Schenectady (chapter 24), and ten thousand dollars at Utica (chapter 423); sixty thousand dollars to enlarge the entrance to Ohio basin at Buffalo to a channel eighteen feet deep by forty-five feet wide (chapter 145); three thousand dollars to complete Erie basin to the same depth by one hundred feet wide, on which work was then progressing (chapter 588); twelve thousand dollars for a dam at Schoharie creek feeder (chapter 571); eight thousand dollars for the Rocky Rift dam and feeder (chapter 655); and five thousand dollars more for the great aqueducts (chapter 84). The usual number of special appropriations for heavy swing or lift-bridges was obtained by the cities along the canal, generally upon payment of at least one-half the cost by the State: at Buffalo ten thousand dollars (chapter 668), at Lockport, seven thousand five hundred dollars (chapter 573), at Rochester, twelve thousand five hundred dollars (chapters 559 and 560), at Fairport, ten thousand dollars (chapter 576), at Syracuse, seven thousand dollars (chapter 385), and at Canajoharie, nine thousand dollars (chapter 592), this last sum being later deemed insufficient, so that plans were not prepared.

In May of 1894 the Constitutional Convention to which delegates had been elected in November, 1893, assembled pursuant to the statute. Among the amendments approved by the convention was one (section 10, article 7), providing that the canals might be improved in such manner as the Legislature should provide by law, and that a debt might be authorized for that purpose in the mode described by section 4 of the same article, or the cost of such improvement might be defrayed by the appropriation of funds from the State treasury or by equitable annual tax. It was considered that, although this section conferred no additional powers upon the Legislature beyond those which they possessed under the existing constitution, the vote at the ensuing

November election, when the amendments were submitted to the people, was an expression of public approval and a mandate to the Legislature to undertake the improvement of the canal. The amendment was carried by 115,343 majority.⁸⁹

The season of canal navigation was from May 1 to November 30, or two hundred and fourteen days. The lake opened April 28 and the Hudson from March 18 to December 24.

Another amendment (chapter 724) was made to the law affecting mortgages on canal-boats, making the same valid against creditors or against subsequent purchasers or mortgagees in good faith, as long as the debt which the mortgage secured was enforceable.

It may be noted that the Forestport reservoir, which was commenced in 1884, was declared completed this season. It was asserted that this would create an abundant supply of water for that portion of the canal between Syracuse and Little Falls, this section being absolutely dependent upon this supply and that of the feeder at Rome.

The dam across the Mohawk river at Cohoes, having fallen into disrepair, the Legislatures of 1893 (chapter 643) and of 1894 (chapter 462) appropriated ninety thousand and twenty thousand dollars, respectively, for its rebuilding. The plans for this were deemed worthy of attention, as calling for a sheet-iron apron laid in concrete, a somewhat novel form of construction.

The Genesee river reservoir project was early in the field of public attention. The report of Engineer Rafter was submitted by the State Engineer, with his annual report⁹⁰ of 1893, to the Legislature. A new location, known as the "Hogback," was selected in preference to any of the several sites previously considered. The natural conformation at this point in the canyon presented many advantages for the purpose and an earthen dam one hundred and thirty feet in height, with a core of masonry and an entirely separate spillway, was advocated, all above fifty-eight feet in height to be built at the expense of riparian owners, who should have in return the use of the surplus water beyond that needed for the canals.

⁸⁹ *Report of Superintendent of Public Works, 1894.*

⁹⁰ *Assembly Documents, 1894, No. 21.*

This was followed on February 6, 1894, by a lengthy petition¹ to the Senate from the mill and other owners interested, urging the construction of a dam and reservoir upon the river.

On April 1, Mr. Rafter made his final report² on the subject to the new State Engineer, Campbell W. Adams. Extensive tests had meantime been made of the Genesee shales and other available constructive material as to their strength in concrete blocks with a result so satisfactory as to eliminate further discussion of other forms of construction, either at the "Hogback" or the other locations. To insure responsibility and early completion, it would be necessary to let the work in its entirety as one contract.

The report closed with the following résumé, giving the benefits to be derived:

"(1) The furnishing of an adequate supply of water to the western division of the Erie canal, under all circumstances.

"(2) A great increase in the permanent water power of the Genesee river at Mount Morris, Rochester and intermediate points.

"(3) The protection of the Genesee flats and the city of Rochester from destructive floods . . .

"Taking the total cost of the Genesee river storage dam, 130 feet in height, at \$2,400,000, and the storage at 7,700,000,000 cubic feet, we derive a cost per million cubic feet stored of \$311.69.

"On taking the total cost at \$2,600,000, and the storage at 7,100,000,000 cubic feet, we have a cost per million cubic feet stored of \$366.20."

The total tonnage of all canals for 1894 was 3,882,560, of which the Erie carried 3,144,144. This was a decrease of 449,403 tons under the previous year, and the smallest tonnage since 1859. The principal cause was alleged to be the general stagnation of business from which all modes of transportation suffered about equally. To this was added the customary lack of better and quicker modes of transportation by canal and the perfection of railways for the carrying trade.

¹ *Senate Documents*, 1894, No. 46.

² *Report of State Engineer*, 1894, pp. 392-393.

The total receipts of grain of all kinds at the port of New York during the season of canal navigation was 85,194,369 bushels, of which the canal carried 42,608,700 bushels, or 50.01 per cent. But, notwithstanding this percentage, it should be remembered that other cities and states diverted over 50,000,000 bushels, causing a loss to the people, at five cents per bushel, of \$1,807,770. Sixty-seven boats were registered, averaging two hundred and thirty-nine tons. The aggregate payments for ordinary repairs and maintenance of the canals for the fiscal year ending September 30, 1894, were \$780,661.44.

CHAPTER V.

SECOND ENLARGEMENT OF THE ERIE.

From the legislative enactment authorizing a nine-foot channel to the beginning of the third enlargement, or the Barge canal.

The division of the history at this point is somewhat arbitrary, for, as we have seen, the agitation which culminated in the second attempt to enlarge the waterway started several years earlier, but the beginning of 1895 marks the time when the project was definitely formulated in law, just subsequent to the popular declaration for some radical form of improvement.

The constitutional amendment to section 10, article 7, became operative on January 1, 1895, and this year promised to be one of increased activity in canal matters. A complete transfer of political authority in both executive and legislative branches of the State Government had occurred, and it was hoped that great benefit would inure to the whole commonwealth from the new order of things.

The National Government had deepened the lake channel from Chicago to Buffalo to twenty feet, and the Hudson river to twelve feet, while the Erie canal remained at seven feet for boats drawing only six feet. The Canadian Government was also preparing to enlarge its system from twelve feet to twenty feet, from Chicago to Montreal. These facts mainly led to a convention of mercantile exchanges which was held in September of 1894 at Toronto, Canada, in which delegates from the western cities in the grain belt participated. The Georgian Bay canal project was inaugurated, shortening the haul to tide-water several hundred miles, and promising to be a dangerous competitor to the canal systems of our own state.

The Governor urged upon the attention of the Legislature the necessity of prompt action upon the question of improving the canals, and the State Engineer, in his annual report for 1894, presented an elaborate argument as to the value of the canals to

the State and the necessity of their permanent improvement. All the improvements so far were of a temporary character. Comparisons were presented between the efficiency of the canal as it then stood, on the one hand, and the five great competing trunk lines of railway, as well as the Canadian canals, on the other. The idea of a ship canal the State Engineer deemed to be impracticable, and he recommended that the canals be improved by (1) deepening to nine feet, (2) lengthening the remaining locks, (3) the use of high lifts where necessary, (4) greater speed by the use of electric towage and (5) reducing cost of maintenance.

As to electric propulsion, he reported that the Milligan system appeared to supply all the necessary requirements and to solve the problem of easy and rapid canal transit. This system, briefly stated, consisted of a line of fourteen-foot posts in the rear of the tow-path, bearing two continuous rails, known as the east and west-bound rails, about three feet apart. A twenty-horse-power motor ran on these rails and from the motor a tow-line connected with the boat.¹

Immediately upon the assembling of the Legislature of 1895 the subject of canal improvements was considered. On January 9, in the Assembly, Mr. Clarkson introduced a bill making provision for issuing bonds to an amount not to exceed nine millions of dollars for the improvement of the Erie, the Champlain and the Oswego canals, and providing for the submission of the measure to be voted upon by the people at the general election of the year 1895.²

After the usual procedure this bill was finally passed by the Assembly on January 19, by a vote of eighty-three to thirty-one and by the Senate on February 21, by a vote of nineteen to four. It became a law on March 9, 1895, with the Governor's approval, and in accordance with its terms and with constitutional requirements was submitted to the people at the ensuing November election for approval. In the event of such approval it was provided in the bill that the Comptroller should issue not more than nine million dollars in semi-annual four per cent bonds, to run not more than seventeen years and to be sold for not less than

¹*Report of State Engineer, 1894.*

²*Laws of 1895, chapter 79.*

par, in lots of not more than four million dollars at one time. Premiums were to be applied to the sinking fund established for the payment of principal and interest, and an annual tax of thirteen-hundredths of a mill upon all taxable property was authorized for this fund.

By the terms of the bill (§ 3) as applied to the Erie canal, the improvement was to consist of deepening the canal to a depth of not less than nine feet of water, except over aqueducts, miter-sills and other permanent structures which might be left at eight feet. The deepening might be accomplished by raising the banks where practicable. Locks remaining to be lengthened were to be improved and provided with necessary machinery, and vertical stone walls were to be constructed where required.

The usual number of appropriations for special canal purposes was also made by the Legislature of 1895. The amount of these special appropriations was afterwards stated to be about \$660,000.^a Among them were \$77,500 from the balance remaining of the fund for deepening the canal under chapter 572, Laws of 1894, reappropriated to lengthen locks Nos. 21 and 22, and \$10,000 from the same source to dredge lower Black Rock harbor (chapter 320); \$31,250 to build the State's half of a bridge at Porter avenue, Buffalo, the city to contribute an equal amount (chapter 18); \$25,000 for a bridge at Exchange street, Rochester (chapter 514); \$18,000 for bridge changes in motor power at Genesee street, Utica (chapter 170); \$30,000 for drainage of State ditches at Cowassalon creek and swamp (chapter 366); \$20,000 for drainage at Tonawanda (chapter 19); \$10,000 for a similar purpose (chapter 307) and \$20,000 for the repair of the dam at Rexford Flats (chapter 560).

Senate resolutions were also introduced reciting the facts that the canals annually cost one and one-half million dollars to maintain; that many other states were benefited by their service as a through freight rate regulator; that it was the policy of the United States to maintain interstate waterways; that the people could not sell the canals constitutionally; and that it was inequitable that New York should bear the entire burden of their maintenance while other states enjoyed their principal benefits. The resolutions instructed their Representatives in Con-

^a*Report of Superintendent of Public Works, 1895.*

gress to support and urge the passage of a bill providing that the United States Treasurer should annually pay to the Comptroller of New York three-fourths of the expense of their maintenance for the preceding year. By this means the opponents of the canals sought to divert public thought from the question at issue and to obtain the defeat of the referendum, but the resolutions were finally tabled.⁴

An act providing for the construction of a dam on the Genesee river, for the purpose of supplying water to the Erie canal and of restoring to the owners of water-power on the Genesee river the water diverted by the State for canal purposes, was also passed by both Houses and sent to the Governor, but it failed to secure his approval and did not become a law.⁵

In November, 1895, under Senate resolution 130, which became a law on March 2, 1895, the President appointed a United States Deep Waterways Commission, consisting of James Angell, John E. Russell and Lyman E. Cooley. The report made to the commission by Mr. Cooley contains a large amount of valuable information on this subject and is accompanied by profiles of all the routes, giving information not before published. The report of the commission was published under date of 1897, as H. R. Doc. 192, 54th Congress, 2d Session.

The publication which contained the most general discussion upon the subject of New York State canals was that of the proceedings of the International Deep Waterways Association, which met at Cleveland, Ohio, on September 24-26, 1895. The proceedings of this convention were published in a book of four hundred and sixty pages which contains a vast amount of valuable discussion on the general subject, including articles by Thomas C. Clarke, Lyman E. Cooley, Chauncey N. Dutton, S. A. Thompson of Duluth and others.⁶

Navigation opened on the canals on May 3 and closed December 5, for the season of 1895. Lake navigation was open after April 4, and the Hudson river from April 2 to December 9. The season was remarkable as being the driest in many years. Lakes Erie and Ontario were from two to four feet below their normal

⁴*Senate Journal*, 1895.

⁵*Legislative Journals*, 1895.

⁶*Report on Barge Canal*, 1901, pp. 981-982.

elevation. Extreme care was used in drawing upon reserve supplies, but an abundant supply for navigation in the canals was maintained. At Buffalo, on several occasions, with adverse eastern winds, the canal surface was lowered four or five feet and the unusual sight was presented of loaded boats lying hard and fast on the bottom of the canal until the wind shifted and the prism was again filled to its usual level.⁷

An innovation in canal boat construction should be noted for August of 1895, in the trial trip of a fleet of steel canal boats—one steamer and five consorts—put in commission by the Cleveland Steel Canal Boat Company. A thorough working trial was given them, with very satisfactory results and three more fleets on improved plans were ordered. The boats were about ninety-eight feet in length, by eighteen feet beam, and ten feet deep, made of three-eighths-inch open hearth steel. Light, they drew one and one-half feet; capacity of consorts on a six-foot draught, two hundred and thirty-five net tons, and of propeller, one hundred and thirty net tons. The latter was fitted with fore-and-aft compound engine of one hundred and twenty horse-power, and boiler of Scotch type. Diameter of propeller, sixty-four inches, making one hundred and sixty revolutions per minute; approximate cost of propeller, fifteen thousand dollars and of consort, six thousand dollars; time, New York to Cleveland, loaded to six feet, thirteen days.⁸

In October of 1895, there occurred another series of tests of electrical propulsion, the trial being made at Tonawanda by the Erie Canal Traction Company, of the "Lamb" system, which consisted of a line of poles along the bank supporting a stationary cableway, on which electric motor carriages traveled, towing the attached boats. The department was represented by Electrician Barnes of Rochester, and his report was made to the Superintendent of Public Works on December 11, 1895. From his computations the cost of propulsion, under experimental conditions that were somewhat disadvantageous, would be, for a boat whose gross weight was two hundred seventeen and one-half tons at a speed of two and one-half miles per hour, 2.1 cents per boat-mile for power or \$7.66 per trip and a like sum for tow-motor

⁷*Report of Superintendent of Public Works, 1895.*

⁸*Report of State Engineer, 1895.*

rental. The energy consumed would vary approximately as the cube of the speed divided by the ratio of speed, and the item for motor rental would vary as the power divided by that ratio. Thus, if the speed should be increased to three and one-half miles per hour, the power would be increased from 8.5 to 23.4 electric horse-power, the cost of current to 4.1, and of motor rental to 4.1 cents, making 8.2 cents per mile, or \$29.93 per trip. Making allowance of one-third time for delays there would be twenty-three trips per season at the lower speed and thirty-two trips at the higher speed. This was considered to fall far short of the cost of towage prevailing at the time. In comparison with the trolley system, tried in 1893, several points of advantage were noted. Among them, the elimination of the necessity for building propeller boats, no space required for electrical machinery, and the absence of propeller wash. The system was fully endorsed by the expert.⁹

In the Milligan system the motor was carried on rigid rails. There was no sagging between poles, and an even strain on the towing-cable was maintained. It had double tracks upon which two motors traveling in opposite directions might pass without exchanging motors as in the Lamb system. On this last-named system the motor was carried on flexible cables and was much cheaper in both installation and maintenance.

The great interest in enlarged canals manifested by the Deep Waterways Association, and by the results of the recent elections led to a preliminary survey and estimates for an enlarged canal by the "Oswego Route" by Resident Engineer Albert J. Hines, under direction of the State Engineer, in the fall of 1895. The route was from Troy through the Mohawk river to Rome, thence into Wood creek and across Oneida lake, thence down the Oswego river to Lake Ontario. This was, to a certain extent, the line suggested by Elnathan Sweet in his paper before the American Society of Civil Engineers in 1884. The Mohawk river was to be canalized into a series of level pools by means of dams. The bottom width was to be one hundred feet, the depth of water twenty feet, and the locks four hundred and fifty feet long by sixty feet wide. Huge elevator lifts were to be used, one at

⁹*Report of Superintendent of Public Works, 1895.*

Cohoes of one hundred and thirty feet and another at Oswego of half that height. The length of the contemplated canal was one hundred eighty-two and one-half miles and the total cost of the enlargement was estimated at eighty-two million dollars.¹⁰

Only twenty-seven boats were registered during the year 1895, of which seventeen were from two hundred and forty to two hundred and fifty tons. The total tonnage of the canals for the year was 3,500,314, compared with 1894, a loss of 1,000,692 tons, of which the loss in wheat was 622,996 tons and in corn, 177,453 tons. The total receipts of flour and grain delivered at the port of New York by all routes during the season of canal navigation was equivalent to 87,783,418 bushels, of which the canals brought 14,612,700 bushels or 17.08 per cent. These figures show a large falling off in the trade and tonnage of the canals for 1895.

This was another year of great commercial stagnation, although conditions were somewhat better than during the previous year. It had probably proved to be the most disastrous to canal interests of any within the past sixty years, by reason of the ruinous competition of the parallel railway lines and the comparative inefficiency of the canals. Without any apparent reason the railroads reduced their rates nearly fifty per cent below those of the year before, and to a point which was profitable neither to themselves nor to the boatmen. The Legislature had decided to refer the question of expending nine million dollars in canal improvements to the people at the November election. If the canals and their usefulness could be discredited by an overwhelming reduction in tonnage before the election, might not the vote upon the amendment be negatived and the canals remain in desuetude as a competitor? This explanation was officially suggested.¹¹

Certain obnoxious exactions by lock-tenders from the boatmen had gradually attained such proportions as to call for vigorous action by the Superintendent. Particularly was this the case at Lockport and at the "sixteens" near Cohoes. Boatmen had to pay tribute in passing these locks or suffer personal abuse, delays, swelling of boats against the walls, or flooding of their boats.

¹⁰*Report of State Engineer, 1895.*

¹¹*Report of Superintendent of Public Works, 1895.*

It was little better than highway robbery and had been too often winked at by officials. During this season a vigorous effort at length effectually stamped out the system.

The condition of the bridge over the canal at West Main street, Rochester, demanded attention and, by chapter 625 of the laws of 1894, the State Engineer was required to prepare plans for a complete overhauling of the structure, or if the cost of these repairs should approach that of a new bridge, then to submit estimates for the latter to the Legislature. In September of 1894, Mr. George W. Rafter was instructed to visit and inspect movable bridges in Europe, with a view to the selection of some appropriate type adaptable to this and other points on the canal. Meantime certain repairs were made to the existing bridge, which bettered conditions materially.

Mr. Rafter submitted an interesting report to the State Engineer on January 15, 1895, reviewing the various forms of movable bridges in different countries, but he seemed to find no type among them particularly adapted to use upon the Erie canal, either for general service or at the Rochester crossing. He was impressed with the advantages of fixed bridges of high span with long easy approaches, both in point of beauty and utility, and recommended their use for canal crossings wherever practicable.¹²

In view of Mr. Rafter's report, new plans were, therefore, prepared in 1895 for a lift-bridge, with pressure applied to cylinders by an accumulated weight operated by a water-wheel driven by water from the canal. But owing to the fact that local public opinion was divided as to whether a fixed or movable bridge was wanted, and to the unsettled questions arising from contemplated general improvements in the canal under the "Nine Million" act, the State Engineer, in January of 1896, recommended to the Legislature that no immediate action be taken.¹³

Various devices for the propulsion of boats were at this time given careful consideration. The State Engineer recommended an electrical propelling device, invented by C. N. Dutton, as being superior to any yet tested, in the low cost of construction, the ease with which boats could pass without switches or double

¹²*Report of State Engineer, 1894.*

¹³*Report of State Engineer, 1895.*

tracks, and the facility with which wide waters could be crossed. The economy in construction would insure to every boat a motor and screw, while only every fourth boat would need to be so supplied. In general terms, it consisted of a cable of twisted wires supported on posts; an adjustable propelling apparatus carried on the boat and a trolley pole, controlled by the steersman, and of a length sufficient to reach the conducting cable from any portion of the navigable canal. Bulger's adjustable propelling apparatus with feathering paddles intended to eliminate bank wash was similarly brought to notice.¹⁴

At the November election, in 1895, the people again expressed their determination that the canals should be improved and the law providing for their enlargement was ratified by a majority of 276,886. As soon as the State board of canvassers had declared the results of the ratification of the "Nine Million" law, which they did on December 12, the Comptroller advertised for sale bonds to the amount of two million dollars. Unfortunately, at this juncture, Venezuelan complications with Great Britain arose, and another Government bond sale was ordered, but notwithstanding these difficulties, \$1,770,000 was sold on January 9, 1896, at a premium of 1.378. These were three per cent, ten-year bonds, due in 1906.

As to the manner in which the general improvements authorized by the "Nine Million" act should be executed, the Superintendent of Public Works held the opinion that any substantial improvement short of a deep waterway, or ship canal, should have as a central idea the increase in speed of boats of existing tonnage, rather than the increased section of waterway, and in his view the appropriation available was for the necessary rebuilding of dilapidated structures, the restoring of strength and durability to the canal and for putting it in perfect condition rather than for its enlargement, except as to depth. The purpose should be to increase the number of boat trips appreciably, in anticipation of the adoption of improved methods of propulsion by steam or electricity.¹⁵

By January 13, 1896, surveys were started over the entire length of these three canals, a distance of four hundred and fifty-four

¹⁴*Report of State Engineer, 1895.*

¹⁵*Report of Superintendent of Public Works, 1895.*

miles. Twenty-eight survey sections were allotted to as many parties and over two hundred men were drawn from the civil service lists and put into the field, in order to obtain the necessary data for plans before navigation opened. This done, the forces were reduced and plans begun. For many years this method of improvement, commonly known as the "Seymour plan," had been the subject of general discussion. In the preparation of plans many unforeseen difficulties were presented.¹⁶

To deepen the Lockport level of twenty-eight miles, much of it through rock, was a puzzling proposition. Assistant Engineer George W. Rafter was, therefore, assigned to make a thorough investigation of the question of water-supply from Lake Erie and other sources on the western division. On April 1, Mr. Rafter submitted his report, which appeared in Appendix I of the State Engineer's report for 1896. Thereafter during the year plans were made covering the improvements at Lockport.

The question of raising the banks or deepening the bottom, especially through cities, was often determined by the grade of important bridges or other structures or by extensive commercial establishments on the canal banks, again by the feeders and the heights of their dams, and in other cases by the level of important aqueducts or other controlling features. All of these difficult matters largely account for the seeming delay in beginning construction.¹⁷

The river and harbor act, under date of June 3, directed the Secretary of War to cause to be made accurate examinations and estimates of the cost of a ship canal for the most practicable route, wholly within the United States, from the Great Lakes to the navigable waters of the Hudson river, of sufficient capacity to transport the tonnage of the lakes to the sea. The Secretary of War detailed Major T. W. Symons, Corps of Engineers, U. S. A., to prepare this report. It contains a discussion of the general proposition of the various routes and of the class of vessels adapted for their navigation. In its conclusions this report states that the route considered best for a ship canal is by the Niagara river, Lake Ontario, Oswego river, Oneida lake, and the Mohawk and Hudson rivers; also that the Erie canal, im-

¹⁶*Report of State Engineer, 1896.*

¹⁷*Id.*

proved and enlarged and modified to give a continuously descending canal from Lake Erie to the Hudson, and the canalizing of the Mohawk river will give better results than a ship canal and at one-quarter the cost.

On April 1, 1898, this report was discussed at length before the House committee on rivers and harbors of the Fifty-fifth Congress by Mr. S. A. Thompson, of Duluth, who was later Secretary of the board of trade of Wheeling, West Virginia. This discussion contained a great amount of valuable information and was published by the Government printing office in 1900, under the title of "Proposed Ship Canal Connecting the Great Lakes and the Atlantic Ocean."¹⁸

In 1896 the United States Deep Waterways Commission published a report with map and sectional profile showing the most direct line through the Oswego-Oneida-Mohawk valleys, between Oswego and Troy, following the channels of the rivers and the lake and showing their materials. These were made by Wm. Pierson Judson and are described in the report by the United States Deep Waterways Commission to be "the first map and profile adequate for the consideration for a ship canal." These were also published separately with title "Lake Ontario to the Hudson River, 1896."¹⁹

In the way of canal legislation for 1896 a radical difference in methods of appropriation was manifest. By the terms of chapter 947 a general tax of one-tenth of a mill was imposed, which was expected to yield revenue of about \$425,000. Of this amount, in compliance with departmental suggestions, \$50,000 was devoted to the installation of a general system of electric communications on the canals, and of the remainder \$125,000 was available to each division for use in extraordinary repairs and improvements on that division. At the close of the year it was stated that the wisdom of this course had been fully vindicated and a similar appropriation of \$360,000 was asked for the ensuing year.²⁰ The customary special appropriations for various canal purposes were almost entirely lacking in this year's legislation. Very few of these were passed, and only for small amounts.

¹⁸*Report on Barge Canal*, 1901, p. 982.

¹⁹*Id.* p. 973.

²⁰*Report of Superintendent of Public Works*, 1896.

Chapter 881 of the laws of 1896 permitted floating elevators to be maintained on the canals at stations to be assigned by the Superintendent; chapter 794 amended chapter 79 of the previous year, as urged by the Superintendent, shortening the time of advertising contracts and so facilitating the work; while in the "Supply Bill" was an item appropriating ten thousand dollars for making further investigations as to the foundations of the proposed dam at Mount Morris and as to the best means of transporting materials to its site, and also for making detailed plans.

Navigation opened on the canal on May 1 and closed December 1, two hundred and fifteen days; the Hudson river was open from April 7 to December 19 and Lake Erie opened to navigation at Buffalo after April 19. Less trouble was experienced at the latter place, from low water in the canal, than in any previous year. It was hoped that the work to be done under the general improvement act would entirely relieve this trouble.

As promised, two or three more fleets of steel boats were added to the service during the season and were remarkably successful in their results. The trip from Cleveland to New York was made in from ten to twelve days, and the ability of the boats to withstand heavy gales while on the lake was encouraging. In the estimation of the projectors it was believed that they could successfully compete with railways as they then existed, at a fair margin of profit.²¹

For the fiscal year ending September 30, 1896, the expense of ordinary repairs and maintenance was stated to be \$1,006,453.70. The whole number of tons carried in 1896 by all canals was 3,714,894; of this there were east-bound, 2,605,012 tons; and of through freight, 2,132,956 tons; the Erie canal carried 2,742,438, an increase over 1895 of 214,580 tons. On agricultural products, however, there was an actual increase of 492,656 tons, the small total increase being due to losses in other products. As to comparative flour and grain receipts at the port of New York during the season of canal navigation, May 1 to December 1, the total receipts by all routes were equivalent to 112,121,954 bushels, of which the canals carried 31,672,499 bushels or twenty-eight and one-quarter per cent.

²¹*Report of Superintendent of Public Works, 1896.*

Under the fifty thousand-dollar appropriation to establish a system of electric communications, plans for two different methods of installation were obtained and submitted to an expert for examination and both were approved. The estimated cost was \$150,000. Actual construction was deferred until the following season and a second appropriation of \$50,000 was advocated in order to secure early completion and benefits from the system.

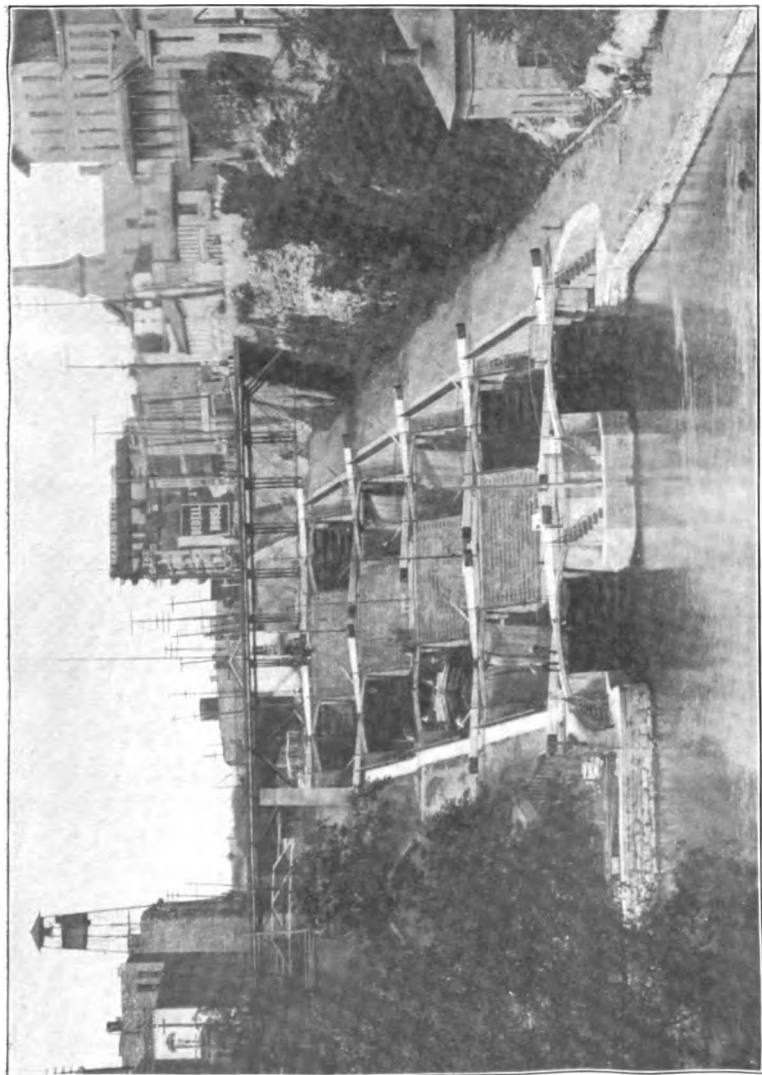
During the year plans under the general improvement act, to the amount of three and one-half million dollars, were prepared and contracts were let. Generally the work was to begin with the close of navigation.

At the close of the year the Superintendent stated that he had been assured by the State Engineer that the appropriation of nine millions of dollars would be sufficient to secure the depth contemplated in all three of the canals indicated, and added that the contract prices so far made would seem to warrant this prediction.²² But the State Engineer in his report stated that this sum would not suffice to put the canals in their highest state of efficiency.²³ It was admitted to have been a year of unprecedented financial stress in which the resources of the banks had fallen off thirty million dollars, but Governor Black in his message of 1897 urged the energetic pushing of canal improvements, in order that the full value of the appropriation might be utilized, instead of being frittered away in commissions, boards and other expenses.

Locks Nos. 21 and 22 were placed under construction. These, with possibly lock No. 2, and the three at Newark, were believed to be all that would admit of lengthening in the usual manner. Lock No. 1, at Albany, was regarded as difficult and expensive to improve, and the fact that eighty-five per cent of canal traffic sought the river at West Troy rendered its improvement of doubtful expediency. In place of locks Nos. 3 to 18, known as the "sixteens," it was proposed to build a steel aqueduct from the head of lock No. 18 to a rocky point on the opposite bank of the river, and there to place a mechanical lift of one hundred and forty feet, capable of passing two boats at once. From here the

²²*Report of Superintendent of Public Works, 1896.*

²³*Report of State Engineer, 1896.*



THE COMBINED LOCKS AT LOCKPORT.
(Copyright by O. N. Ranney.)

river was to be canalized on the south side to the Champlain canal. The estimated cost of "improving" the existing sixteen locks and levels was \$1,686,831. The mechanical lift-lock would cost about two-thirds of this sum. Among the many benefits to be gained by the proposed construction there may be mentioned the saving of thirty-four thousand dollars annually in lock-tending, and the abundant supply of water for the Cohoes mills. The four Little Falls locks would probably be lengthened in the usual manner. At Newark, the three locks were to be reduced to two of higher lift. At Lockport the difficulties were regarded as enormous, but finally plans for a mechanical lift, combined with a new alignment, were decided upon. These lift-locks were to be operated by compressed air, and the preparation of plans was conducted under the supervision of the inventor, Chauncey N. Dutton.²⁴

It was considered that under the blanket appropriation for each division, provided by chapter 947, the work on extraordinary repairs and improvements was greatly facilitated. The waters from serious leakages were collected and carried away in ditches; numerous deposits of silt under aqueducts and culverts were removed, adding to their safety and avoiding damage suits. Earthen or timber reservoir dams, especially on the middle division, were out of repair, and a great variety of work was done in connection with them, and still more was needed. They were considered to be in much better condition than for thirty years past, according to Division Engineer Gere's report. Several aqueducts required rebuilding and, as they were not expected to be rebuilt under the "Nine Million" act, they were paid for out of the blanket appropriations, and for reasons of economy in view of the forthcoming improvements, were made to carry nine instead of eight feet of water, as directed under the former act.²⁵

A popular misapprehension seemed to exist as to the scope of the "Nine Million" act, which the Superintendent in his report for 1896 hastened to correct. The general idea seemed to be that it was applicable to the reconstruction or improvement of any structure on any canal. But it was officially construed by the Department to mean that it could only be used on the Erie, Oswego

²⁴*Report of State Engineer, 1896.*

²⁵*Id.*

or Champlain canals, and that no expenditures for construction should be made unless such improvement or construction was necessary to, and formed part of the general plan of improvement. It followed that improvements to locks, aqueducts, waste-weirs and culverts, and for cleaning out feeders, creeks, and like expenditures must be made under some other appropriation.²⁶

The improvements then under way and contemplated would result, it was believed, in a reduction of the tractive power required to move a given weight at a given speed. This would result either in shortening the time of a trip without increasing the motive power or in an increase of load and speed without an increase of power. Experiments so far seemed to warrant the expectation of lowering the cost of movement substantially, even though hampered by a restricted prism, owing to deposits of silt.

On February 22, 1897, the Superintendent of Public Works addressed a communication to the Legislature upon the subject of the rate of wages paid by contractors on State work to unskilled laborers. Conditions then prevalent enabled the average working man to earn but twelve and one-half cents per hour, making one dollar for an eight-hour day, or six dollars per week, a sum insufficient for the support of himself and of his family. It was suggested that the Legislature fix a minimum price of not less than fifteen cents per hour for unskilled labor on the canals and other State work. A bill was later introduced and passed by the Legislature to remedy this evil, but by clerical neglect it failed to come properly before the Governor and so did not become a law.²⁷

Under the provisions of the appropriation of ten thousand dollars (chapter 950, Laws of 1896) Engineer Rafter submitted a voluminous report on the Genesee river storage project, on January 1, 1897, which was embodied in the State Engineer's report for 1896 as Appendix VII. The State Engineer's department held that the restrictive clause in the law, confining further investigation to the site at Mount Morris, was inserted under the misunderstanding that this site had been finally selected after exhausting the possibilities of the project and that, in view of the fact that the act which passed the Legislature in 1895, but

²⁶*Report of Superintendent of Public Works, 1896.*

²⁷*Senate Documents, 1897, No. 26.*

failed of approval, had left the question of location open, while providing a sum for further research, a fair interpretation of the intent of the law would still leave the question of the best location to be determined by further investigation, and with the concurrence of the Comptroller this view governed the work.

A new site at Portage was examined. By reason of its greater elevation five hundred feet of additional head could be utilized for commercial purposes. The solid rock foundation, found here at surface, and the narrower section of the canyon presented a saving of more than fifty per cent over the Mount Morris site in the cost of masonry for dam alone, and a dam one hundred and eighteen feet in height at this location, estimated to cost one million dollars, would provide storage for fifteen billion cubic feet as against a storage capacity of seven billion three hundred and seventy million cubic feet at the Mount Morris site. From a financial point of view, computations were made as to the relative power to be furnished by both the Mount Morris and the Portage projects and their value at the City of Rochester, by which the former was shown to be commercially impracticable and only to be constructed and maintained at an annual loss of many thousand dollars, while the Portage plan exhibited a net income of several hundred thousand dollars.²⁸

A careful examination of Mr. Rafter's report, together with the prior reports upon this gigantic scheme for storage and regulating works, leads the average reader to but one conclusion. While the proposition was admirable in plan, and entirely feasible from an engineering standpoint, its salient feature was its proposal to restore to the mill owners of Rochester and vicinity the volume of water which came to their wheels in years long gone by, and of which they were deprived, not so much by its diversion for canal purposes as by the deforestation of the catchment basin of the upper Genesee by owners of forest lands, and for this loss the State was asked in this manner to provide compensation. For the use of the canals it would appear that the existing works at Rochester would furnish ample supply.

Sundry bills were introduced in the Legislature of 1897, to prevent extortion and combination in transferring State canal

²⁸*Report of State Engineer, 1896.*

grain, discriminations in freight rates against shippers by canal and to provide for State elevators. One of these, by Mr. Koehler, was to submit to the people at the next November election a proposition to issue three and a half millions in bonds, and with the proceeds buy all boats, harbor-tugs and Hudson river tow-boats used in the transportation of flour, grain and merchandise, and all dry docks and boat yards used in the repair and building of canal, tow and tug-boats plying between Buffalo and New York along the Erie canal and Hudson river, the ownership to be vested in the people and to be operated by the State, in order to cheapen transportation to the minimum rate between producer and consumer. These various measures were referred to committees and apparently died there.²⁹

Another change was made in the statute regulating chattel mortgages on canal-boats and craft, by section 92 of chapter 418, by which they were henceforth to be filed in the office of the Comptroller and not elsewhere.

Chapter 566 provided for a tax of nine and one-half hundredths of a mill, out of the proceeds of which three hundred and sixty thousand dollars was to be apportioned equally between the three divisions of the canal for extraordinary improvements and repairs, and fifty thousand additional for installing electric communication. Chapter 595 provided for the leasing of surplus waters of the improved canals at the discretion of the authorities. Chapter 415, known as the "labor law," gave preference to citizens of the state for employment upon public contract work, including the canals.

Under the sundry civil act of June 4, 1897, the President, on July 28, appointed a United States Board of Engineers on Deep Waterways, consisting of Major Charles W. Raymond, Corps of Engineers, U. S. A., Alfred Noble and George Y. Wisner. During this year and the three years following, appropriations were made, aggregating \$485,000, which were expended by this board in exhaustive surveys of the waterways and routes through the Great Lakes and thence to tide-water. The resulting report of this board was presented to Congress on December 1, 1900. The lines examined by this board across New York State were: from Lake Erie to Lake Ontario; from Oswego, by way of the Oswego-

²⁹*Legislative Journals*, 1897.

Oneida-Mohawk valleys to the Hudson; and by way of the St. Lawrence river to Lake St. Francis, thence across the country to Lake Champlain and thence through Lake Champlain and the upper Hudson to tide-water. Estimates were made for both a twenty-one and a thirty-foot depth on each of these routes.

The route from the Hudson river to Lake Ontario was divided into three portions which were as follows: that portion from Oswego to Herkimer, which was in charge of Albert J. Hines; that portion from Herkimer to the Hudson, which was in charge of David J. Howell; and the subject of water-supply, which was in charge of George W. Rafter. These surveys and estimates included two projects through the Mohawk valley, one for a high level canal across the summit near Rome, and the other for a low level, cutting the summit down to the regulated level of Oneida lake.³⁰

Canal navigation opened May 8 and closed December 1, two hundred and eight days. Lake Erie was open from April 6, and the Hudson river from April 29 to December 7. The season was again an unusually dry one throughout the drainage area for supplying the canals, but owing to improvements recently made in storage capacity, no hindrance to navigation on the main canals occurred.

There were 2,332 boats navigating the Erie canal, of which 1,117 were grain carriers, and were rated as first, second and third-class. The others were classed as carriers of coal, lumber and other coarse freight. Most of them were old and rotten and required only a slight accident to sink them. Very few new boats had been built during the past ten years. Many were propelled by mule-power, such as had been in vogue for many years. Practically the only improvements were a few steam-propelled fleets. There were registered during the year eleven boats of two hundred and fifty tons, three boats of two hundred and forty tons, and one each of two hundred and twenty-five and one hundred tons.

The aggregate payments for ordinary repairs and maintenance for the year ending September 30, 1897, were \$904,309.48, as against \$1,006,453.70 for similar payments for the previous year. The total receipts of flour and grain at New York by all routes

³⁰Report on Barge Canal, 1901, pp. 970 and 973.

during the season of navigation, May 1 to November 30, 1897, were 140,030,101 bushels, of which the canals brought 20,998,561 bushels or 14.99 per cent. The whole number of tons of freight carried on the canals in 1897 was 3,617,804, of which more than two-thirds was east-bound and about one-half was through freight. Of the total tonnage the Erie canal carried 2,584,916. The tendency seemed to be toward a larger way freight business and a decrease in through freight.

The season was not a prosperous one for boatmen. Rates were unusually low and many owners preferred to tie up their boats rather than accept the rates offered. The principal causes were alleged to be deterioration of the canal prism, non-improvement of boats and motive power and excessive terminal charges at Buffalo and New York. The earnings of an elevator at Buffalo for handling a cargo of 200,000 bushels of grain at prevailing rates would be about \$2,650. A single elevator, costing a quarter of a million dollars, was known to have paid for itself in a single year. Nearly all of them were under the control of a trust and received a share of the profits, whether operating or not. The Superintendent of Public Works considered that the better remedy would be to control these excessive charges by statutory limitation rather than to provide State elevators.³¹

In his report at the beginning of 1898, State Engineer Adams also strongly presented the necessity of curbing excessive terminal grain charges in order to supplement the improvements of the physical features of the canal, claiming both to be necessary to the restoration of the commercial supremacy of New York City. In support of this argument numerous references were made to the report, already noted, of Major Symons to the Federal Government.³²

During the latter part of 1897 it began to be fully realized by those connected with the work of canal improvement and to be generally understood by the public that the whole amount of contemplated work could not be accomplished with the nine million dollars, and with these reports came rumors of alleged frauds and extravagance in the administration and prosecution of the undertaking.

³¹*Report of Superintendent of Public Works, 1897.*

³²*Report of State Engineer, 1897.*

At the beginning of 1898, Governor Black at once called the attention of the Legislature to the canals, saying that the work of deepening them, for which an appropriation of nine million dollars had been made, could not be completed for that sum. That amount had been disposed of and less than two-thirds of the improvement had been provided for. The Governor thought that the completion of the work should be considered as the last half of the same project, but it was a subject of the utmost importance and a problem too serious to be decided by the Legislature. The people had voted for the nine million appropriation and if a further sum was needed it should also receive the people's sanction.

The Governor asserted that New York City was not getting her share of commerce and intimated that this might be on account of a too narrow policy with reference to terminal facilities. If this were so, the State should open such facilities in New York harbor as would draw every pound of freight which would naturally come there. A broad and liberal policy was demanded, and competition—especially Canadian—should be feared and met. The Governor also advised the creation of a commission to examine into the cause of the decline and the means of reviving the commerce of New York.³³

On January 12, 1898, the State Engineer and the Superintendent of Public Works addressed a joint communication to the Governor stating that the original appropriation of nine million dollars would be insufficient to complete the work and that another large sum would be needed. This would require the submission of the question to popular vote, and in order that such vote might be intelligently taken, they recommended that a committee of examination and estimate, composed of the ablest and most impartial citizens, be appointed to consider the whole subject.³⁴

In both Senate and Assembly, bills were introduced relative to the appointment of an investigating committee to inquire into the expenditure of the nine million-dollar appropriation. Numerous amendments and substitutions were made and a bill

³³*Governor's Annual Message*, 1898.

³⁴*Senate Documents*, 1898, No. 4.

of this nature finally became a law, known as chapter 15.³⁵ This bill, passed February 23, provided for the appointment by the Governor of a commission of from five to seven citizens to fully investigate and report upon the "nine million" improvement and all matters connected therewith. This report was to be made to the Governor by June 1, 1898, unless he should extend the commission's time to July 1, and was to be open to the public and to be transmitted by the Governor to the next Legislature.

The commissioners appointed by Governor Black at once organized as follows: George Clinton, chairman; Franklin Edson, secretary; Smith M. Weed, Darwin R. James, Frank Brainard, A. Foster Higgins and William McEchron, commissioners. The commission appointed Edward P. North, consulting engineer, Lyman E. Cooley, advisory engineer, and Abel E. Blackmar, counsel. In addition to taking testimony, the commissioners personally inspected the most important points, and their engineers examined the entire line of the Champlain, Erie and Oswego canals. Their report (referred to later) was dated July 30, 1898.

But few other laws of importance affecting the canals were passed at this legislative session. Chapter 506 imposed a seven-hundredths of a mill general tax, from the proceeds of which three hundred and fifty thousand dollars was to be available for extraordinary repairs and improvements on the canals. Chapter 644, passed April 29, authorized the appointment of a commission of five by the Governor, to inquire into the condition of the commerce of New York, the causes of its decline and means of its revival, to summarize their conclusions, suggest advisable legislation and to report by January 15, 1899.

Work under the general improvement plan was stopped suddenly just as canal navigation was about to be resumed in the spring of 1898, and was left in such an unfinished state that the resources of both the ordinary and extraordinary funds were strained to the utmost limit to enable navigation to be resumed at all.

On July 30 the commission appointed to investigate the nine million-dollar improvement reported to Governor Black, their

³⁵*Senate Journals*, 1898.

time having been extended to August 1, by the Legislature (chapter 327). Appended to their report³⁶ was one to the commissioners from their consulting engineer, Edward P. North, and their advisory engineer, Lyman E. Cooley. Thereupon Governor Black appointed Judge Edwin Countryman to examine the report, to determine whether legal proceedings—civil or criminal—should be begun, and if so, against whom and in what way.

The report contained numerous criticisms of both State Engineer Campbell W. Adams and Superintendent of Public Works George W. Aldridge. Thereafter, on September 12, Mr. Adams addressed a communication to Governor Black which he termed a "statement on his part" in reply to certain features of the report of the investigating commission. This explanatory statement was published in the State Engineer's annual report for 1898.³⁷

The publication of these documents was made the basis of an acrimonious controversy which was taken up by the public press and colored according to the various attitudes of the writers upon the question of canal improvement. It cannot be disputed that this was a critical period in the history of the canals. The people of the state had generously authorized the appropriation of a sum which they had been told was sufficient to complete the improvements desired. Their sense of disappointment at the results was keen and the blame fell heavily. The criticism by the commission was of dual nature. The State Engineer was blamed for the fact that the nine million-dollar appropriation did not cover the cost of the proposed improvement. This involved the charges of insufficient estimates, lack of foreknowledge of the peculiar difficulties encountered in construction, and improper classification of materials excavated. The Superintendent of Public Works was largely censured for extravagant and unnecessary expenditures during construction.

Adverting to the period of the Constitutional Convention in 1894, we notice that when the canal amendments were under discussion, the State Engineer was called upon for estimates. But no available data were at hand. For several years prior the State Engineers had urged the Legislatures to appropriate money

³⁶*Assembly Documents*, 1899, No. 78.

³⁷*Assembly Documents*, 1899, No. 72 (Report of State Engineer for 1898), pp. 277-364.

for a thorough survey for contemplated improvements, but without success. However, upon the inadequate information at hand and the notes of the old Van Buren survey (1876), which the investigating commissioners themselves examined and pronounced worthless for the purpose, the estimate was made and delivered to the Convention within twelve days. It was expressly stated to be but a guess, assuming all conditions to be favorable, and was not nine million but eleven million five hundred and seventy-three thousand dollars, with another million needed for repairing and rebuilding walls. The Legislature, later, without consulting Mr. Adams, as he states, reduced the amount to an even nine million dollars, as being all that the people would be willing to authorize at the time. The statute required the work to be commenced within three months.

The department endeavored to rush through a complete new survey, which could not be so thorough as the conditions demanded. The result of the survey was that the estimates were raised to thirteen and a half millions, exclusive of engineering, advertising or inspection, or fifteen millions in all. Later this was revised and made sixteen million dollars. For the discrepancy between the ever-increasing estimates and the appropriation of nine million dollars, Mr. Adams was at the time severely criticised, though always denying the responsibility. Later developments seem to have amply justified his denial and to place the blame upon the Legislature, where it justly belongs. In speaking of this subject, Governor Theodore Roosevelt, in a message transmitting the report of the New York Commerce Commission to the Legislature on January 25, 1900, said in his usual direct and emphatic style: "I desire especially to call your attention to that portion of the Commerce Commission's report which shows the main source of the trouble over the nine million dollar expenditure for improvements under the Act of 1895. The Commerce Commission's report makes it perfectly clear that there never was sufficient authority, or indeed any authority for supposing that this nine million dollars would be enough to complete the work, and that a sum was named which was entirely insufficient. It was doubtless believed to be easier to get the small sum than a large one."⁸

⁸*Assembly Documents*, 1900, No. 69, p. 6.

The original contracts were let upon the unit system, which has been in vogue for many years upon public works—that is, so much per cubic yard for rock or earth actually excavated. There always have been and always will be advocates of the “lump sum” method of bidding, as opposed to the “unit system.” Mr. Adams summed it tersely by saying that so long as the State got value received for every yard paid for, it made little difference whether the original estimates were too high or too low, the final estimate, upon which payment was based, showing just what the original estimate would have been, if absolutely correct.

During the period of construction, when the water in the prism was necessarily entirely drawn off, at some places for the first time in many years, the footings of the banks and walls were thus exposed to the action of frost and floods. Imperfections in the work of former years were revealed, structures were further disintegrated, unexpected difficulties developed and the cost was largely increased. Especially was this the case through Buffalo and other cities.

The investigating commissioners stated that the new work was well done, that prices bid were reasonable and that the contracts were let to the lowest bidder. They called attention to the high value of the canals as the cheapest means of transportation, both in the past and at present, and as a freight regulator. They severely condemned the dual system of control and advised that the sole responsibility be vested in one department, preferably that of the State Engineer. They recommended the continuation of the improvement, regardless of its cost, with more accurate studies of the conditions and specifications; also that proper compensation be exacted from parties using surplus water and that none but surplus water be so used; that the practice of erecting structures on canal lands, and of emptying sewers therein, be stopped; and that an experimental pneumatic lock be built only at Newark. The commission further called attention to the fact that the entire cost of construction, enlargement and maintenance of the canals up to 1885 was \$102,345,123, while the total tolls received were \$134,648,900, to which could be added the enormous aggregate representing their indirect influence on the prosperity of the State.

On July 1, 1898, Engineer G. W. Rafter, acting under his instructions of December 31, 1897, made a final report to the State Engineer upon the results of further tests as to the strength of concrete blocks, in connection with the Genesee storage project. His conclusions were that the successful use of concrete required the oversight of a man of high intelligence, thoroughly versed in the possibilities of the material, that all thumb rule methods should be avoided and that dry mixing and thorough ramming should be enforced.³⁹

Navigation on the canals opened May 7 and closed December 10, 1898. The Hudson river was open from March 14 to December 12, and the lake ports after March 25. The season again did not prove a prosperous one to the boatmen. But four new boats were registered, one each of one hundred and fifty and one hundred and twenty-five tons, and two of one hundred tons. The total tonnage of the canals for the year was 3,360,063, of which 2,314,050 tons were east-bound and 1,046,013 tons were west-bound. Of through freight 1,573,227 tons were carried, of which 1,111,699 tons were east-bound. Of the gross tonnage, the Erie canal carried 2,338,020 tons. The aggregate payments for ordinary repairs and maintenance for the fiscal year of 1898, were \$923,903.67.

On November 28, 1898, Judge Countryman filed with the Governor his report and findings upon the report of the canal investigation commission. Thereupon the Superintendent of Public Works, George W. Aldridge, requested the Governor to suspend him from his office, pending the result of the judicial inquiry into his official acts. On December 2, Governor Black so suspended him and directed the Attorney-General to present his case to the grand jury. The Attorney-General, under these directions from the Governor, assigned Benjamin J. Shove, one of his deputies, to ascertain when, where and what crimes had been committed in connection with the canal enlargement and to proceed with prosecutions.⁴⁰

At an early date in 1899, after submitting the report of the commission and Judge Countryman's conclusions thereon to the Legislature as required by law, Governor Roosevelt, impressed

³⁹*Report of State Engineer, 1897.* pp. 375-460.

⁴⁰*Report of Attorney-General, 1898.*

with the importance of the matter, appointed additional counsel, Messrs. Austin G. Fox and Wallace Macfarlane, to assist the Attorney-General's office in further examination as to whether the case should be submitted to a grand jury.

On April 7, Messrs. Fox and Macfarlane wrote to the Governor asking an immediate appropriation to enable them to further examine witnesses, and this communication was at once sent to the Legislature by the Governor, with the request for immediate attention.⁴¹ In compliance, the Legislature, on May 2, by chapter 495, appropriated twenty thousand dollars for the expenses of inquiry into matters pertaining to the awarding and performance of canal improvement contracts, with the proviso that the special counsel should report progress within three months thereafter. Also, chapter 569 appropriated five thousand dollars for salary and expenses of Benjamin J. Shove, Deputy Attorney-General.

After due consideration, Messrs. Fox and Macfarlane made their final report to the Governor. In substance they found that most of the matters under consideration were barred by the statute of limitation and as to the remaining matters, while there was evidence of conduct justifying severe criticism and public indignation, there was not enough to warrant criminal proceedings. This report was attached to the Governor's annual message for 1900.

In reply to a Senate resolution of January 19, 1899, State Engineer Edward A. Bond and Superintendent of Public Works John N. Partridge, on February 6, submitted a tabulated statement of all contracts let under the provisions of the "nine million" act, together with the existing status of those unfinished and the amount and time required to finish them, the figures being given from department records. The total amount paid on contracts was \$7,238,795.08, the amount retained, \$694,162.58, making total paid or due on contracts, \$7,932,957.66. There had been paid for advertising, \$92,320.70, inspection, \$180,501.36, disinfectants, \$6,482.49, miscellaneous, \$227.44, engineering, \$820,000. The total of all payments made or due was \$9,032,489.65, making a deficit of \$32,489.65. To this deficit should be added the estimated amount required to finish contracts, \$4,430,007.88, engineering \$236,600, and inspection \$101,400, making the total amount re-

⁴¹*Assembly Documents*, 1899, No. 61.

quired to complete awarded contracts, \$4,800,497.53. One more season would be required to complete most of the contracts, a few others would require two seasons, while several would apparently take three seasons to complete.⁴²

On May 5 the Legislature, by chapter 544, enlarged the powers of the canal board in settling unfinished contracts made under this act, authorizing them to terminate existing contracts, and to pay off the contractor, including the ten per cent reserved. Few other canal laws were passed at the session of 1899. Chapter 208 provided a seven-hundredths-mill general tax, from the proceeds of which three hundred and fifty thousand dollars was set aside for extraordinary repairs and improvements of mechanical and other structures, and works connected with the canals.

On January 18, 1899, the commission on commerce of New York, appointed by Governor Black under the act of April 29, 1898, and consisting of Charles A. Schieren, Andrew H. Green, C. C. Shayne, Hugh Kelly and Alexander R. Smith, reported that, owing to a defect in the statute under which they were acting, they were left without funds to pursue the investigation properly. They recommended a continuance of the committee under improved conditions.⁴³ Governor Roosevelt, in his annual message, also endorsed this recommendation, and by chapter 494, the commission was given an extension of time until November 1, 1899, in which to make final report and the sum of fifteen thousand dollars was appropriated for their expenses.

Chapter 519, passed May 4, authorized the canal board to permit the construction of a pneumatic lock and canal connections, in place of the "sixteens" at Cohoes at the expense of private parties and provided for their subsequent rental or purchase by the State upon completion, at the option of the canal board, if found upon due trial to operate satisfactorily. The minutes of the canal board do not show that the required permit was subsequently granted.

Governor Roosevelt, on March 8, appointed a new committee, consisting of Gen. Francis V. Greene, chairman, Frank S. Witherbee, Major Thomas W. Symons, U. S. A., John P. Scatcherd and Geo. E. Greene, who, together with Edward A. Bond, State Engi-

⁴²*Senate Documents*, 1899, No. 34.

⁴³*Senate Documents*, 1899, No. 23.

neer, and John N. Partridge, Superintendent of Public Works, were to consider the whole canal question and report upon the proper policy to be pursued by the State in the future. By this means the Governor was enabled to obtain an opinion from prominent engineers and business men who, after thorough and careful investigation, could be relied upon to give an able and unbiased decision, and one which, from the personnel of the committee, would be considered authoritative by the general public. The appointment of such a committee was most opportune at this time. The inadequacy of the canals to meet the growing needs of commerce had long been conceded. The first enlargement was scarcely completed in 1862, before the need of further improvements was realized, and for years attempts had been made to reach a solution of the canal problem, until in 1895, the question was supposed to be settled for many years. Now, after the miscarriage of that project, opinions, both expert and popular, were so varied that a guiding hand was needed. The people had evinced a willingness to approve whatever undertaking was necessary, if an adequate policy were designated, but they were in no mood to temporize or experiment and this office of guidance the committee fulfilled. From its appointment may be dated the beginning of the Barge canal enterprise, although a very similar scheme had been advocated by State Engineer Martin Schenck in 1892.

The Erie canal was opened to navigation on April 26, 1899, and closed on December 1, making the longest season since 1882. The season was a prosperous one for boatmen. Rates were remunerative and on some freights unusually high. More boats could have been used to advantage, but the building and registry of new ones seems to have ceased. The Hudson river opened April 17 and closed December 15, while the lake was free from ice on April 28.

The cost of ordinary repairs and operating expenses on the canals of the state for the fiscal year ending October 1, 1899, was given as \$867,148.41. The total receipts for flour and grain by all routes at New York, from May 1 to November 30, were 125,464,839 bushels, of which the canals carried about thirteen per cent. The total tons of freight carried on the canals during 1899 was 3,686,051, of which 2,425,292 tons went eastward and

1,260,759 tons westward. There were 1,692,972 tons of through and 1,993,079 tons of way freight. Of the through freight 1,164,605 tons went eastward, and 528,307 tons westward and of the way freight 1,260,627 tons went eastward, and 732,452 tons westward.

On January 25, 1900, the New York Commerce Commission, appointed by Governor Black in 1898, and continued under a legislative act of 1899, submitted to the Governor a voluminous report, which was transmitted by him to the Legislature and published as an Assembly document of that year.⁴⁴ The report assigned, as a leading cause of the decline, the differential rates on all western traffic. These rates had been agreed upon in combination between trunk line railways to the seaboard, discriminating against New York in favor of other Atlantic seaports. As a contributing cause, the report mentioned the excessive terminal charges. The commission especially censured the New York Central and Hudson River Railroad Company for participating in such agreement, and demanded its withdrawal therefrom.

The commission recommended, as the best remedy, that the State should complete the improvement of its canals under the nine million plan, by the further expenditure of a sum not to exceed fifteen million dollars, after the submission of a bonding bill for that purpose to the people at the next election. The commission also advised that suitable terminal piers and facilities should be provided both at Buffalo and New York exclusively for canal traffic; that elevator charges should be reduced to a maximum rate of one-half cent per bushel on grain; that the limitation of the capital stock of transportation companies to fifty thousand dollars should be repealed; that the City of New York should endeavor speedily to supply the demands of commerce for modern piers, and that the Legislature should aid the effort in every way practicable.

The committee appointed by Governor Roosevelt on March 8, 1899, to advise as to the future canal policy of the State, continued its investigations during that year and reported to the Governor under date of January 15, 1900. The report showed a very exhaustive study of the whole question and was accompanied

⁴⁴*Assembly Documents*, 1900, No. 69.

by many maps and tables, the records of public hearings and a large correspondence with those who were qualified to advise on the subject. After careful consideration the committee most emphatically recommended that the canals should not be abandoned, but that the Erie, Champlain and Oswego canals should be enlarged—the Erie to a size suitable for thousand-ton barges, and the Champlain and Oswego to a nine-foot depth, according to the 1895 project. It also recommended that the Black river and the Cayuga and Seneca canals should be maintained as navigable feeders, but not enlarged; that the scheme for a ship canal was a proper subject for consideration by the Federal Government, but not by the State of New York; that the money for the improvements should be raised by bond-issues to be paid by taxes upon the counties bordering on the canals, the Hudson river and Lake Champlain; and that \$200,000 should be immediately appropriated for making detailed surveys in order to consummate the proposed project. As the efficiency of the canals depends upon their management as much as upon their physical size, the committee also recommended that large transportation companies for handling canal business should be encouraged by removing all restrictions as to the amount of capital; that steam or electric propulsion and mechanical power for operating gates and valves and for moving boats in locks should be employed; that State forces on public works should be so organized on a permanent basis as to afford an attractive career to able men; and that the laws should be so revised in regard to the letting of contracts as to make impossible a repetition of former unfortunate results.

If enlarged as recommended, the Erie canal would be of a size suitable for the use of boats one hundred and fifty feet long, twenty-five feet wide and drawing ten feet of water. Such boats were estimated to carry one thousand tons each and a four-boat steam fleet would carry thirty-nine hundred tons, or one hundred and thirty thousand bushels of wheat. The prism would have a depth of twelve feet, a bottom width of seventy-five feet, with side slope of one on two. The locks would be three hundred and ten feet long in the clear, twenty-eight feet wide, with eleven feet of water on the sills. The proposed route followed very closely the line on which the Barge canal is at present being built, and

which will be found described a little later in this chapter. The committee estimated that the Erie could be thus enlarged for \$58,894,668, which, together with \$818,120 for the Oswego and \$1,824,000 for the Champlain, would make \$61,536,788, or in round numbers, \$62,600,000, as the total expense of completing their recommended improvements.

The Legislature considered this report favorably and on April 12, 1900, enacted chapter 411, directing the State Engineer to cause surveys, plans and estimates to be made for improving the Erie, Champlain and Oswego canals as recommended by the committee on canals, except that an alternate project was added for enlarging the Oswego to the same size as proposed for the Erie. A sum of \$200,000 was appropriated for doing this work, which, by action of the canal board, was afterward made to include the survey and estimate for a canal between Lakes Erie and Ontario around the falls of Niagara. A large force of engineers was immediately placed in the field and careful topographic surveys were made, together with frequent borings and a special study of water-supply, conducted by Mr. Emil Kuichling. When the field work was finished, the men were transferred to the office and complete plans and estimates were prepared in time to report to the Governor on February 12, 1901. Much of the territory along the lines of the proposed improvements had recently been traversed by the Deep Waterway surveys, and, as the results of these surveys were made available to the State by the Federal Government, the preliminary work was accomplished economically and expeditiously. The plans for the Champlain canal were all made from former surveys. The State Engineer associated with himself a company of eminent engineers, as an advisory board, and many others, for making surveys and plans, who were experts in their various fields of work, so that a general confidence was established in the accuracy and completeness of the resulting plans and estimates.

Special appropriations at this time were again becoming numerous. In most cases the work was required to be done under the supervision of the Superintendent of Public Works. Of these special canal works, eighteen contracts were completed during 1900, at a total cost of \$184,293.52, exclusive of engineering, on which the original estimates were \$229,127.88. Fifty-eight pieces

of work were authorized by special appropriations. Thirty-three of these were placed under contract, and twenty-five were progressed on State force account. Chapter 311, passed April 6, 1900, provided the usual \$350,000 for extraordinary improvements on canal structures and works.

As told more fully elsewhere in this volume, for several years disastrous breaks had occurred in the Forestport feeder, which were believed to be of malicious origin. These breaks, in 1897-8-9, cost the State over one hundred and thirty thousand dollars for repairs. With the approval of the Governor, the aid of Pinkerton detectives was obtained and as a result thirteen indictments in connection with the matter were found, and a salutary lesson was administered.

Canal navigation opened April 25, and closed December 1, but the last east-bound boats were delayed by a break near Rome until December 10. The Hudson river was open to navigation from April 9 to December 11. The total receipts of grain and flour by all routes at New York, from May 1 to December 1, 1900, were 105,715,669 bushels, of which the canals brought 13.33 per cent. Expenditures for maintenance and ordinary repairs for the fiscal year were \$959,896.63, as against \$867,148.41 for the previous year. The Superintendent attributes the increase to the operation of the eight-hour law, which largely increased pay-rolls, especially for bridge and lock-tending.

The total tonnage for 1900 was 3,345,941, as against 3,686,051 tons for the previous year, a falling off of 340,110 tons. Of the total freight carried 2,115,151 tons went eastward and 1,230,790 tons westward. There were 1,362,550 tons of through and 1,983,391 tons of way freight. Of the through freight 857,607 tons went eastward and 504,943 tons westward, and of the way freight 1,257,544 tons went eastward and 725,847 tons westward. The decrease was probably attributable to a rate war between boatmen and shippers, many boats being tied up at Buffalo awaiting higher rates; also to the late opening of lake navigation (April 23), and to the coal strike which reduced shipments of that article, especially on the Champlain canal. Another important reason was the unsettled canal policy, under which boat-building had ceased and many of the existing boats had become

so dilapidated that some were obliged to go out of commission, while others were unable to get grain insurance.

In 1900 there was another general discussion of the canal question among prominent engineers. This was provoked by a paper presented by Mr. Joseph Mayer, which was published in the October proceedings of the American Society of Civil Engineers, entitled "Canals between the Lakes and New York." At the same time Mr. George Y. Wisner presented another paper entitled "Economic Dimensions for a Waterway from the Great Lakes to the Atlantic." These papers treated the subject very fully and were discussed at length in the proceedings of November and December, 1900, by Major T. W. Symons, Archibald A. Schenck, Thomas C. Clarke, Edward P. North, Thomas Monro, Frank A. Hinds, Elnathan Sweet, W. Henry Hunter, Theodore G. Hoech, Alfred Noble and Lewis M. Haupt. The papers were further discussed in the proceedings for February, 1901, by other members; Rudolph Hering, George Y. Wisner, R. P. J. Tutein-Nolthenius, Joseph Mayer and George W. Rafter.

On February 12, 1901, State Engineer Edward A. Bond submitted to the Governor a full and complete report⁴⁵ of the surveys of the previous year, together with estimates for a thousand-ton barge canal by several different routes from the Hudson river to the lakes. On March 15 Governor Odell presented this report to the Legislature with a special message, summarizing routes and costs, which appeared as *Senate Document No. 38*.

The first route proposed was by way of the Mohawk and Seneca rivers, the distance from Troy to Buffalo being 342.56 miles, including improvements to the Oswego canal from Three River Point to Oswego, nine miles, and of the Champlain canal from Troy to Whitehall, at a total cost of \$78,496,446, from which estimate the value of abandoned lands is to be deducted, amounting on the Erie canal to \$1,941,380, and upon the Champlain canal, \$22,620, which leaves the net cost, \$76,532,446.

The second route proposed was by way of the Mohawk and Oswego rivers, via Olcott to Buffalo, using Lake Ontario, a total distance of 338.66 miles, with improvements to the Erie canal, amounting to \$46,765,755, the Oswego canal, amounting to \$5,170,129, and the Champlain canal at a cost of \$4,750,608, mak-

⁴⁵Report on Barge Canal, *Assembly Documents*, 1901, No. 70.

ing the total gross cost of \$56,686,492, from which should be deducted the estimated value of abandoned lands on the Erie canal, \$1,953,202, leaving the net cost, \$54,708,279.

The third route was by way of the Mohawk and Oswego rivers and Lake Ontario, via Lewiston to Buffalo, a total distance of 347.57 miles, at a total cost of \$48,984,220 for the Erie canal, \$5,170,129 for the Oswego canal, and \$4,750,608 for the Champlain canal, making a total cost of \$58,904,957, from which should be deducted the value of abandoned lands, as in the case of the Oswego-Mohawk route, leaving the net total cost, \$56,926,744.

The fourth route was by way of the present canal—modified—from Troy to Buffalo, 347.66 miles, at a cost of \$81,578,854; for improving the Oswego canal, \$1,481,012, and the Champlain canal, \$5,787,929, making a total cost of \$88,847,795, from which should be deducted the estimated value of abandoned lands on the Erie canal, \$1,530,225, leaving the net cost, \$87,317,570. To this total should be added the improvement of the Hudson river from Troy to Watervliet, \$737,683, and improving Black Rock harbor, \$538,051, a total of \$1,275,734. These latter items were to be added to each of the above estimates if the United States Government should not do this work.

For the purpose of comparison the Governor presented the cost of completing improvements of the canals along the nine million-dollar plan, under the act of 1895, as amounting to \$19,797,823, divided as follows: the eastern division, \$5,825,386; the middle division, \$2,086,987; the western division, \$7,060,950; the Champlain canal, \$2,689,117; and the Oswego canal, \$2,135,388. To this should be added the value of the property taken or injured by this improvement.

As to the comparative cost to the taxpayers it was assumed that money could be borrowed at three per cent interest and that the constitutional bond limit was eighteen years. Providing for a reduction of one-eighteenth each year, the total cost, including interest, would be:

By the first plan, \$97,197,206.42, or \$5,399,789 annually.

By the second plan, \$69,479,514, or \$3,859,973 annually.

By the third plan, \$72,296,964, or \$4,016,498 annually.

By the fourth plan, \$110,893,313, or \$6,160,739 annually.

By the fifth plan, \$25,143,241, or \$1,396,846 annually.

Upon the estimated valuation of that date, the total cost per \$1,000 would be: first plan, \$17.14; second, \$12.25; third, \$12.74; fourth, \$19.55; fifth, \$4.43.

These plans and estimates, as required by chapter 411, Laws of 1900, provided for not less than twelve feet of water throughout the Erie canal for boats of one hundred and fifty feet in length by twenty-five feet in width and of ten feet draught, with a cargo capacity of about one thousand tons; the bottom width to be not less than seventy-five feet, with a cross-sectional area of not less than eleven hundred and twenty-five square feet, except where modified through cities, and not less than eleven feet of water was to be provided for in locks and over structures. The locks were to be three hundred and ten feet in the clear, by twenty-eight wide. The Oswego canal was to have nine feet of water in the prism generally, eight feet of water in locks and over structures. Locks were required to pass boats of eight feet draught, seventeen and one-half feet wide by one hundred and four feet long. Other plans were also made to correspond with the dimensions of those of the Erie canal. The Champlain canal plans provided for deepening to seven feet of water, to pass boats having six feet draught, ninety-eight and one-half feet long by seventeen and one-half feet wide.⁴⁶

These various plans were subsequently considered by the Legislature, but differences of opinion among the friends of canal improvement prevented concentration upon any one plan. In the Senate a bill to issue bonds not to exceed twenty-six million dollars for canal enlargement and to submit the proposition to the people in November following was advanced to a third reading but was finally tabled. In the Assembly a similar bill was introduced, but failed to get beyond second reading.⁴⁷

By the terms of chapter 81, Laws of 1900, additional powers had been conferred upon the canal board, enabling it to hear, determine and settle in full contractors' claims connected with the cessation of work under the "nine million" act. Under this act sixteen contractors filed claims up to the close of 1901, the claims amounting to \$1,038,870.98. These cases were heard and

⁴⁶*Report on Barge Canal, 1901, pp. 56, 57.*

⁴⁷*Legislative Journal, 1901.*

awards made amounting to \$473,458.59, or about 45½ per cent of the claims.⁴⁸

Carrying out the policy of the previous half dozen years, chapter 347 appropriated \$325,000 for extraordinary repairs and improvements of existing mechanical and other structures and works connected with the canals.

In reply to a Senate resolution of March 20, the Superintendent of Public Works informed the Senate that at that date there were 207¾ miles of poles and wires strung along the banks of the canals within the "blue line," and in addition twenty-eight miles of this were duplicated by other lines. These were for the various purposes of power, light, heat and message transmission, most of them by formal permits from the department, but not all; some probably by verbal permission of division and section superintendents.⁴⁹

After 1890 the general law governing transportation corporations provided that navigation companies might be formed with not less than twenty thousand dollars as a minimum limit. At that period huge corporations were rapidly obtaining control of elevators and other terminal facilities. Traffic had been diverted from the canals, both by excessive terminal charges and by the connections of these navigation companies with other and competing transportation lines. The individual boatman of limited capital, whose welfare as the partner of the State was a matter of concern, became alarmed lest he should be entirely driven from the canals, and in his interests chapter 935, Laws of 1896, amended the law of 1890 by inserting "canals and other waterways" among the routes to be operated, and adding, "No corporation organized under this act and designed to navigate any of the canals shall have a capital stock exceeding \$50,000." The minimum also was lowered to \$5,000. This situation was continued until 1901, but as it failed to produce the beneficial results hoped for, chapter 483, of the latter year, again amended the law by substituting, for the \$50,000 limit, the following: "No railroad corporation shall have, own or hold any stock in any such corporation." Both the New York Commerce Commission and

⁴⁸*Report of Attorney-General*, 1901.

⁴⁹*Senate Journal*, 1901, p. 1605.

the "Greene" Committee on Canals had advocated the repeal of this restrictive measure.

The work of supplementing improvements partially completed under the "nine million" act was inaugurated upon the suspension of those contracts and carried on through 1899 and 1900 and was continued through 1901, so far as money could be spared from the extraordinary repair funds. This work was carefully selected from that most urgently required to preserve the integrity of the canals as a whole and directly to maintain navigation.

As to special legislative appropriations the year began with seventeen unfinished pieces of work, for which the appropriations amounted to \$203,420.29, which were all completed for \$167,869.08, exclusive of engineering. Of the thirty-six pieces authorized during the year twenty-four were started, twelve under contract and twelve done by State force. The appropriations for the contracts were \$177,457.83; they were awarded for \$152,369.60. Of the State force work eight pieces were completed for \$18,697.06, for which appropriations were \$19,500.

The Erie canal opened to navigation May 7, 1901, more than two weeks later than the previous season, and closed at midnight of November 30. The season was an unusually prosperous one for boatmen, the amount of business being limited only by the number of boats available. The Hudson river was open from March 28 to December 1, and the harbor at Buffalo after April 20. The ice closed in three days prior to the date of closing. Every effort was made to assist belated boats, but in spite of this one hundred and thirteen loaded boats were caught in transit on the Erie canal.

The expenditures for the maintenance and ordinary repairs of canals for the fiscal year were \$972,633.23. The total tonnage for the year was 3,420,613, an increase of 74,672 tons. The total east-bound tonnage was 2,276,199, and west-bound, 1,144,414. The total through tonnage was 1,312,526, of which 858,622 tons were east-bound and 453,904 tons west-bound. The total way tonnage was 2,108,087, of which 1,417,577 tons went east and 690,510 tons west.

The triple fleet of eighteen steel canal boats, built at Cleveland and placed in commission in 1898, which had been regarded by friends of the canal as a hopeful sign of its future prosperity,

were withdrawn and sent to the Philippines, where greater opportunities for profit existed. The owners admitted that the boats had made money, but alleged that the profits were meagre because of the lack of terminal facilities at Buffalo and New York, stating that the decline in rates could be met by boats, if it were possible to secure dispatch in discharging, and that the canal was destined to be a failure without such facilities.⁵⁰

During the legislative session of 1902, the question of canal policy again held a prominent place. At the beginning of the year, Governor Odell submitted two recommendations to the Legislature:

First, that the proposal to enlarge the canal locks to one thousand-ton barge capacity and to provide a new channel from the Hudson river to Rexford Flats (at a cost of \$13,694,540) be submitted to the people as a proposition by itself.

Second, that the canal be deepened to nine feet on such portions as were less than that depth (at an additional cost of \$15,076,936) and that this proposition also be submitted to the people for their approval or disapproval.⁵¹

Numerous bills authorizing bond issues for canal improvement were introduced in both Houses of the Legislature. In the Assembly one for \$37,800,000 was considered. Among the substitutes offered was one for abandoning the canals and constructing railway tracks exclusively for freight traffic in the beds. This bill was defeated on final vote by sixty-seven to sixty-three. Other bills for various amounts failed to emerge from committee, both in the Assembly and Senate.⁵²

On April 1 there was an occurrence in the Senate which commands our notice, because of its unique character, standing almost alone in legislative acts of this nature. A concurrent resolution was offered and referred to the committee on commerce and navigation, calling attention to the conspicuous services of Major Thomas W. Symons, who, having been for eight years past stationed in New York State and having been recently transferred to Washington, D. C., had given gratuitously a great amount of time to the study of the canal problem of the State and had

⁵⁰*Report of Superintendent of Public Works, 1901.*

⁵¹*Governor's Message, 1902.*

⁵²*Legislative Journals, 1902.*

materially aided in its solution. The resolution expressed appreciation of his able, broad-minded and public-spirited labors in behalf of the State.⁵³

But little canal legislation appears in the form of special statutes, although a large number of pieces of work were required by legislative appropriations to be constructed under the direction of the Superintendent of Public Works. These were authorized under sections of the general appropriation and supply bills. Chapter 183 appropriated \$250,000 for extraordinary repairs in the usual form. Chapter 420 appropriated \$45,000 to replace the Forestport dam by one of masonry or concrete.

Erie canal navigation opened April 24, 1902, the earliest date for twenty years. It closed December 4, being held open several days beyond the official closing date to accommodate belated coal shipments. Notwithstanding the lengthened season, the tonnage fell off 146,167 tons from that of 1901. This decrease was coincident in time with, and directly due to, the anthracite coal strike of this year. But for this, the tonnage would have shown an increase. Prices received by boatmen were much better than had been customary. Obviously the abandonment of many dilapidated boats and the failure to replace them with new ones, and the still unsettled condition of canal policy also had a direct bearing on the gross tonnage carried.⁵⁴

The expenditures for ordinary repairs and maintenance of the canals and the collection and compiling of statistics for the year ending September 30, 1902, were \$931,051.59. Of extraordinary repairs the Superintendent says that there were sixteen unfinished pieces on January 1, 1902, all of which had since been completed. The appropriations for them were \$323,496.05, and the work was done for \$282,272.48, exclusive of engineering. Twenty-four pieces were authorized during the session of 1902. Of these, twenty were started and of these twenty, thirteen were placed under contract for \$197,916.85, for which the appropriations were \$247,583.06. The remaining seven were undertaken by State forces; two of these, for which the appropriations were \$9,000, had been completed for \$8,571.97.⁵⁵

⁵³*Senate Documents*, 1902, No. 35.

⁵⁴*Report of Superintendent of Public Works*, 1902.

⁵⁵*Id.* p. 18.

The total flour and grain receipts at New York by all routes, from May 1 to December 1, were 74,651,355 bushels, of which the canals carried 15.84 per cent. The total canal tonnage for 1902 was 3,274,446. Way freight east was 1,502,553 tons; west-bound was 669,986 tons; through freight east was 752,194 tons and west-bound, 349,713 tons.

During the year claims on account of the nine million improvement were filed and passed upon by the Court of Claims, in which the amount claimed was \$656,326.94, upon which judgments adverse to the State amounted to \$142,195.21.⁵⁶

Speaking of economy in canal repairs, State Engineer Bond called attention to the great improvement during recent years in the manufacture of American Portland cement and the advantage and economy to be obtained by substituting concrete for the much more expensive cut-stone masonry. These advantages had been fully recognized by the engineering department, it being considered that the best class of concrete instead of cut stone would give better results at less than half the cost.⁵⁷

At the beginning of the year 1903, Governor Odell expressed his conviction that the compromise canal measure to complete the canals by deepening to nine feet, while providing locks of size sufficient to pass thousand-ton barges, in view of possible further enlargement, which failed to pass the Legislature of 1902, so failed because of a conviction on the part of many of the members that such a plan was inadequate to meet the requirements of commerce. Wise and considerate action was urged by the Governor. The commercial bodies in Buffalo and New York stood pledged to the Barge canal plan. Means of revenue to meet the obligations were discussed by the Governor and constitutional extension of the bonding period to fifty years and return to a system of tolls, which would render the system self-maintaining, were suggested.⁵⁸

The Legislature at once took up the problem of the canals. Assembly bill No. 330 provided for the issue of \$82,000,000 in bonds to provide for the expense of improvement, based upon the plans and estimates made by State Engineer Bond in 1900. As

⁵⁶*Annual Report of Court of Claims, 1902.*

⁵⁷*Report of State Engineer, 1902, p. 8.*

⁵⁸*Governor's Annual Message, 1903.*

usual this canal legislation met with bitter opposition. The following professedly favorable measure may be cited as an example of the methods used to delay action. On January 22 resolutions were introduced in the Senate, reciting the fact that the United States Government had expended four hundred and eighty-five thousand dollars for an engineering commission during 1897-1899 to make complete surveys for deep waterways; that the commission reported on page 33 of its report that a down-grade canal from Tonawanda to Utica probably could be safely constructed; that competent engineers asserted that such a plan would not only meet all commercial requirements but would develop water-power throughout the line from Lake Erie worth hundreds of millions of dollars; and that there was a prevalent feeling that insufficient information existed for an intelligent decision by the people as to the future canal policy of the State; and asking the Representatives from New York in Congress to request the Government to provide for the completion of the surveys and examinations (including estimate of cost) of deep waterway routes from the Great Lakes to Atlantic tide-water, including a thirty-foot canal to deliver the water of Lake Erie to the Hudson river, and including a full study of its possibilities for commercial and military uses and for the development of water-power therefrom.⁵⁹

While the bill to provide \$82,000,000 was pending, in view of the lapse of time since the estimates were made, the changes in conditions and in the cost of labor and materials, and the desirability of some changes and additional details, a formal resolution was passed by the Assembly on February 10, requesting from the State Engineer further information upon sundry points.

On March 2 the detailed answer of the State Engineer was given, revising the previous estimates for a Barge canal from Troy to Buffalo and from Three River Point to Oswego, increasing the estimate of the Champlain canal to the amount needed for a channel of the same size as the proposed Erie, adding the cost of a lock and repairs to the canal in the Albany lumber district, also the expense of a lock at the junction of the existing Erie canal with the proposed Barge canal near Fort Bull, and including the improvement of the Hudson river from Troy

⁵⁹*Senate Documents*, 1903, No. 16.

to Waterford and of the Niagara river from Tonawanda to Buffalo, which was omitted from the previous estimates in hope that the Federal Government would undertake the work. At the increased cost of labor and materials and with these additional details and changed conditions, the amount of this revised estimate was \$100,562,993.**

The necessary corrections were made by the Legislature and subsequently chapter 147, known as the "\$101,000,000 Barge Canal Act" became a law. The act is too lengthy for insertion in full. In brief it provided for the issuance of eighteen-year bonds for canal improvement to the amount of not to exceed \$101,000,000, not more than \$10,000,000 to be issued within two years after passage of the act. A general annual tax of twelve-thousandths of a mill was authorized for each million of dollars in bonds outstanding in any fiscal year. The State Engineer and the Superintendent of Public Works were directed to begin improvements to the canals upon the basis of a channel seventy-five feet in width on the bottom, twelve feet of water and at least eleven hundred and twenty-eight square feet of water cross-sections, except at aqueducts and through cities and villages where the width might be reduced and the cross-section of water modified as deemed necessary by the State Engineer with the approval of the canal board. In rivers and lakes the channel was to have a minimum bottom width of two hundred feet, a minimum depth of twelve feet and at least twenty-four hundred square feet of water cross-section. In the statistical part of this volume are given diagrams showing cross-sections of the canal at its several stages of progress, from the original waterway to the enlargement now being constructed. The locks were to be three hundred and twenty-eight feet long by twenty-eight feet wide in the clear, and with eleven feet of water on the miter sills.

Routes to be followed and details of construction were fixed. In general the route of the Erie was by way of the Hudson river from Troy to Waterford; thence by a new channel to the Mohawk above Cohoes falls, and up the canalized Mohawk to Rome, with a few diversions to the existing canal; thence down the valley of Wood creek, across Oneida lake, down Oneida river

***Assembly Documents*, 1903, No. 20.

to Three River Point and up Seneca river to the mouth of Crusoe creek; thence by a new route to the existing canal at Clyde, whence the line of the existing canal was to be followed generally to the Niagara river at Tonawanda and by this river and Black Rock harbor to Lake Erie. All work was to be by contract and provisions for the condemnation of necessary lands and for the sale of abandoned portions of the canal were made. An advisory board of five expert civil engineers and a Special Deputy State Engineer were authorized. The criticisms of the various commissions, that were appointed to consider canal affairs after the 1895 improvement, were heeded in part by vesting most of the responsibility for the work in the State Engineer, giving him authority over both engineering and inspection. The sum of \$10,000,000 was appropriated to begin with and the operation of the entire act was made conditional upon its approval by the people at the election in November following.

The Legislature of 1903 also appropriated, by chapter 581, the sum of \$275,000 for extraordinary repairs of existing mechanical and other structures, and other works on and connected with the canals of the State. Several important structures under special appropriations were completed and in successful operation during the year, among them a guard-lock at Geneva on the Cayuga and Seneca canal, a new concrete dam at Forestport in place of the existing timber dam, and several important bridges. On January 1, there were eleven unfinished pieces of work, all completed during the season; the appropriations for them were \$246,899.01; the cost of construction was \$201,999.63, exclusive of engineering. Twenty-three new pieces were authorized during the legislative session, of which seventeen were inaugurated. Of these, eight were placed under contract for the sum of \$37,672.10, for which the appropriations were \$60,000, and of the remainder seven were started under force account.

Erie canal navigation opened May 2 and closed November 28, 1903. Again many belated east-bound boats were caught in transit by a short cold snap after November 22, making the season nearly three weeks shorter than the year before. The Hudson river opened March 14 and closed December 2, and the lake at Buffalo opened April 6. A heavy increase in tonnage was shown. Initial clearances from Buffalo were the largest

in ten years. The total tonnage was 3,615,403, an increase of 340,957 tons over 1902. This increase was well distributed, both in location and direction, except as to through east-bound freight, which exhibited a heavy falling off. The way freight east was 1,653,294 tons; the way freight west was 771,417 tons; the total increase of way freight was 252,172 tons. The through freight east was 739,518 tons; the through freight west was 451,174 tons. It will thus be seen that the heaviest tonnage was in eastern way shipments, and that the total way shipments exceeded the total through shipments by 1,234,019 tons. Notwithstanding the breaks and interruptions, the season was the most profitable one to the boatmen for eight years. Of the total tonnage the Erie carried 2,414,018 tons. The total receipts of flour and grain by all routes at the port of New York for the season of canal navigation, May 1 to December 1, 1903, were 75,413,020 bushels, of which the canals carried 17.07 per cent.

The expenditures for ordinary repairs and for operation for the fiscal year were \$917,311.72. During the year claims on account of the "nine million" improvement (Class 2), amounting to \$365,149.50, were passed upon by the Court of Claims and judgments allowed thereon to the amount of \$52,275.44.⁶¹

Three unusually disastrous breaks occurred during the season, the last of which, affecting the eastern division mainly, was caused by a Mohawk river flood that resulted from an incessant rain of five days, beginning October 7. Its severity may be noted from the fact that at the upper Mohawk aqueduct the river rose more than twenty-one feet in twenty-four hours. For miles the river and canal were indistinguishable, but by prompt action navigation was resumed by October 18.

The necessity for providing other than animal means of propulsion for boats at points on the proposed system where no towing-path was provided, seemed to have stimulated the question of electric propulsion and further experiments were conducted. On July 21 a permit by the Superintendent of Public Works was accorded to the International Towing and Power Company to test the Wood system of electrical propulsion at Schenectady. A mile of double track girder rail slightly elevated from the ground was installed back of the tow-path. A public demonstra-

⁶¹*Annual Report of Court of Claims, 1903.*

tion was made on October 28, in the presence of Governor Odell, many other State officials, practical canal men, forwarders, boatmen and men of affairs. One boat, then two, and finally four loaded boats, each of two hundred and forty tons capacity, were drawn over the line at a rate of nearly five miles per hour, with a quick start and a notable absence of bank wash. Two "electric mules" were then operated towing two loaded boats in opposite directions. The demonstration was regarded as a success. The company stood ready to equip the existing canals at their own expense and to operate the system upon terms dictated by the State, asking the right of transferring this privilege to the new canal when completed. The Superintendent was inclined to regard the proposition favorably, but consent was withheld for the time being."

It is interesting to notice that the most conspicuous experiments in electric propulsion on the canals have been made in the years 1895 and 1903, when referenda for radical improvements were pending, and that the tests have occurred almost on the eve of election. Whatever may have been the cause of this, canal opponents were quick to spread reports that the trials had proved that no change was necessary, except the installation of the new devices.

At the general election in November, 1903, the act for the proposed Barge canal was submitted to the people, with the result that 673,010 votes were cast for its approval and 427,698 against it, or a majority of 245,312 votes in its favor. Immediately after the canvass of the votes by the State canvassing board, work was begun in preparing plans and in making further studies at points of difficulty.

Of canal legislation in 1904, there was little that need be recorded here; chapter 493 appropriated \$275,000 for extraordinary repairs to mechanical structures on the canals; chapter 200 extended the term of office of members of the advisory board to the completion of the canal.

No serious breaks occurred during the season of navigation, but a month before its opening, ice-jams and floods in the Mohawk valley caused greater damage to tow-path and embankments than had ever been known. The Mohawk river, as a result, actually

"Report of Superintendent of Public Works, 1903.

changed its course to the bed of the canal for several hundred feet at Fort Hunter. Untold damage to private property occurred. The Legislature was then in session and while the flood was at its height the Superintendent of Public Works transmitted estimates for repairs so that by chapter 730 a special appropriation of \$75,000 was made available. Repairs to embankments and structures for over sixty miles were rushed and navigation opened promptly on the date fixed.

Canal navigation opened May 5 and closed November 26, a short season of two hundred and six days. The tonnage was the lowest for ten years, the total being only 3,138,547, a loss of 476,856 tons from that of 1903. Three principal causes were given for this: an early and important strike of lake freight handlers; low freights resulting therefrom; and the limited number of seaworthy boats available. The strike affected traffic instantly. Ordinarily the initial clearances from Buffalo on the opening of navigation kept the western locks busy for several days and nights, but this season only two or three grain boats cleared during the first five weeks of navigation. The way freight east was 1,597,765 tons; the way freight west, 595,516 tons; the through freight east was 550,106 tons and that west-bound was 395,160 tons. Of the total tonnage the Erie canal carried 1,945,708 tons.

The growing relative importance of way tonnage as compared with through tonnage, as affording the best index to the direct benefit to the people of maintaining the waterways, was necessarily brought into prominence by the proposed abandonment of certain sections of the present canal by the proposed Barge canal plan, thus isolating important manufacturing and shipping centers from participation in its benefits. Several of the cities and villages that would be so deprived vigorously remonstrated against the abandonment of any portion of the canal that would not be replaced by a new channel in the immediate vicinity.

Of the work of maintenance and improvements during the year, eighteen separate pieces of work were reported as unfinished on January 1, 1904, of which twelve were completed during the year. The appropriations for this work were \$266,180, while they were built for \$235,050.53, exclusive of engineering. Twenty other

pieces of work were provided for by legislative action during the year; sixteen of these were begun, six by contract and the balance by State force account. The contract prices for the six were \$32,359.15, while the appropriations therefor were \$37,361.46. Five of the pieces on State account were completed during the year, the appropriations being \$83,000 and the cost of completion, \$82,908.39.

The total receipts of flour and grain at the port of New York by all routes during the period of canal navigation, May 1 to November 30, 1904, were 53,980,348 bushels, of which the canals carried 19.34 per cent. Ordinary repairs and operating expenses for the fiscal year of 1904 were \$927,806.65.

During the progress of the "nine million" improvement many State ditches had become filled, some of them outside of the "blue line." The estimated cost of clearing them out was over one hundred thousand dollars and the Superintendent of Public Works, in his annual report, again urged an appropriation for that purpose. Although the sum appeared large, it was stated in support of the appeal that the records of the Court of Claims at the beginning of 1904 showed over seven hundred and fifty claims, aggregating one million dollars, coming from the middle division alone, half of which resulted from the conditions of these ditches. Other similar claims had been added during the year and the aggregate of such claims at its close was estimated at more than one and a half million dollars.⁶³

In line with one of the recognized features of modern improved construction, it had been the intention of the canal authorities from the beginning of active Barge canal investigations to recommend the use of concrete for structures instead of the more expensive cut-stone masonry. The importance of this material may be judged from the fact that about thirteen millions of dollars were involved in the original masonry estimates. During 1904 this feature attracted the attention of that part of organized labor interested in stone work, which resulted in an application to have the specifications changed to provide for cut-stone masonry. After careful investigations, extending to the examination of numerous important railroad, city and

⁶³*Report of Superintendent of Public Works, 1904, p. 15.*

United States Government works in the South and Middle West, Resident Engineer William B. Landreth rendered a report (which may be found in the *State Engineer's Annual Report* for 1905), in which he reached the following conclusions: that concrete of well-selected, proper material, carefully placed, has proved as strong and durable as cut-stone masonry; that its use generally in place of cut-stone masonry is becoming universal, at a cost of from one-fourth to one-third that of cut stone, and that it can be built in much less time; that its use on the work of the Barge canal will prove durable, economical and successful. The present practice of the United States Government is almost without exception based upon similar conclusions. The Advisory Board of Consulting Engineers concurred in this opinion and has maintained the original attitude in this particular.

The proposed canal enlargement includes, to a considerable extent, the canalization of rivers and other navigable waters of the state. In his annual message the Governor called attention to the fact that, within the past twenty years, the United States Government had expended more than three hundred million dollars in river and harbor improvements and that New York State had received but a trifling percentage of this sum as compared with the percentage which her commerce bore to the whole commerce of the United States. Accordingly, he suggested that our Representatives in Congress be requested to press the claims of the State for larger appropriations for the improvement of natural waterways in connection with the canals of the State.⁶⁴

Legislative action in 1905 included the following acts: chapter 722 transferred balances amounting to \$31,044.46 from funds provided by chapter 329 of the laws of 1854 for the enlargement of the Erie, Oswego and the Cayuga and Seneca canals, for the completion of the Black River and Genesee Valley canals and for the enlargement of locks on the Champlain canal to the sinking fund for the "nine million" improvement; chapter 709 appropriated \$200,000 for extraordinary repairs in the usual form; chapter 707 appropriated \$179,000 to pay judgments on canal claims; chapter 700 appropriated \$25,000 towards cleaning out State

⁶⁴Governor's Annual Message, 1905.

ditches on the Erie and Champlain canals filled during the progress of the "nine million" work.

During 1904 a large force of engineers was engaged in making additional surveys and in preparing plans and specifications for carrying out the provisions of the Barge canal act. In order to ascertain whether bids could be obtained within the limits of the previous estimates and thus to learn with reasonable accuracy the probable cost of the whole undertaking, six test contracts, located on different parts of the system and embracing the various classes of work to be encountered, were advertised and bids were opened in December, 1904. A mandatory resolution of the canal board, offered by the Attorney-General, required both unit price and lump sum bids to be made, but this was later modified to a request to that effect, giving to the State the option of accepting either. Lump sum bids were received for some, but not for all of the contracts. The question of the legality of this procedure was raised by the Superintendent of Public Works, for, while the Barge canal law is silent on the subject, the general canal law forbids the receiving of alternative proposals. Upon request, the Attorney-General finally rendered an opinion that, while the canal board was governed by the provisions of the Barge canal law, the Superintendent of Public Works had no option but to make the award to the contractor, who, on the face of his bid, should offer to do the work for the least cost to the State. As all of the itemized proposals were below the lump sum bids, awards were made to the lowest bidders.

Contracts were entered into in April and May, 1905, and operations were speedily begun. The first actual work of construction upon the whole project was performed, without ceremony or ostentation, on April 24, 1905, at Fort Miller, on the Champlain canal, the first work upon the Erie being done at Waterford on June 7, 1905. An important amendment (chapter 740) to the original law was made in 1905. The new act reads: "The locks shall have the following governing dimensions: Minimum length between hollow quoins, three hundred and twenty-eight feet, minimum width twenty-eight feet, minimum depth in lock chamber and on mitre sills eleven feet." The locks, as now planned, will have a length of three hundred and twenty-eight

feet, a width of forty-five feet and a depth of twelve feet. This enlargement can be effected without greatly increasing the cost, and is made to permit the passage of some of the large lake boats. With this change, the capacity of the canal will, of course, be considerably increased, for these lake boats can carry about twenty-six hundred tons, but just what will be the economical size of boats under new conditions—whether one large boat or a tandem of two smaller boats, or whether it may not prove that the best results will be secured by a fleet of four boats, each about one hundred and fifty feet long by twenty-one feet wide, with a combined capacity of about three thousand tons, which can attain a comparatively high speed and can be passed at one lockage—this is a question yet to be determined.

Referring to the change in lock dimensions, the State Engineer, in his annual report for 1905, revealed the reasons which governed the determination of size. As previously indicated, the amendment of 1905 permitted an increase without definitely fixing the size. After a careful study of existing conditions, including the advantages of the great increase in carrying capacity of barges of forty-three feet beam over those of twenty-seven feet, also the fact that Canadian canals now possess locks of forty-five feet width by fourteen feet depth of water on miter-sills, that a large percentage of the distance covered by the proposed Barge canal routes is through canalized, natural waterways possessing width sufficient to enable boats forty-three feet wide to pass each other, and that the proposed changes could be made without exceeding the gross estimates of the cost of the canals, the State Engineer and the Advisory Board of Consulting Engineers recommended changing the dimensions of all locks to forty-five feet clear width, by fourteen feet depth of water on the miter-sills. However, the provisions of chapter 147 of the laws of 1903 provides that no changes of plan shall be made of work under contract, without the approval of the Superintendent of Public Works, and as neither that official nor the majority of the canal board would approve of plans calling for more than twelve feet of water, the State Engineer presented, and the canal board approved revised plans for making the locks already under contract forty-five feet wide by twelve feet in depth, and these dimensions have governed subse-

quent contracts. The new plans also call for the use of steel in place of wooden lock-gates, as previously specified.

Navigation on the Erie canal was opened at noon on May 4 and closed at midnight on November 28. A total tonnage of 3,226,896 was carried by the canals in 1905, a gain of 88,291 tons. For the boatmen the season was the best for many years. Both through and way traffic paid profitable rates. The congestion of railway through freight at Buffalo aided in an increase of rates throughout the season, until in November five cents per bushel was the rate from Buffalo to New York. Ten million tons could have been profitably secured and carried by the canal, but for the lack of seaworthy boats.⁶⁵

The total of 3,226,896 tons traffic was made up of 2,234,484 tons of way freight and 992,412 tons of through freight. Of the way freight the Erie carried 1,392,300, and of the through, 607,524 tons. The eastern shipments total 2,283,583 tons. of which the Erie carried 1,450,175 tons. The western shipments total 943,313 tons, of which the Erie carried 549,649 tons. The expenditures for ordinary repairs, operation and maintenance, including statistics for the fiscal year, were \$912,876.99.

The total appropriations for the fiscal year, 1905, for lock-tending and ordinary and extraordinary repairs were \$170,000 less than the amount appropriated for the previous fiscal year. The Governor expressed a belief that a further saving of \$75,000 could be made and all legitimate demands met, if only such expenditures should be made as were necessary to maintain the present waterways until such time as the Barge canal shall be available for traffic. The number of boats constructed annually during the last ten years has shown a constant decrease and during the last five years the number of new boats added has not exceeded from six to ten in any one year. Older craft have been rapidly going out of commission and a large number of boats navigating the canal are so dilapidated as not to be accepted as insurance risks.⁶⁶

The beneficial results of the provisions of chapter 370, 1905, were especially noted during the year. This act amended the

⁶⁵*Governor's Annual Message, 1906.*

⁶⁶*Id.*

code of civil procedure with reference to the jurisdiction of the Court of Claims in canal cases. Section 264 provided that a claimant should file a notice with the Attorney-General within six months after such claim should have accrued, giving details upon which the claim was based. Section 270 was also amended by requiring the filing of copies of claims and notices of claims with the Superintendent of Public Works as well as with the Court of Claims. This was believed to be an effectual measure against the prosecution of old claims, which, because of lapse of time and lack of evidence, the State could not successfully defend. In the Superintendent's office a bureau of claims was established and employees were notified, in case of accident or condition arising upon which claims could be based, to at once gather statements and make reports after the manner of railway and other corporations for use in case claims were made.

In his annual report for 1905, the Superintendent called attention to a new phase of canal traffic that has been steadily growing in recent years until it has reached large proportions. Up to the present time the use of pleasure craft of suitable dimensions on the canals has been freely permitted, the only requirement being an obedience to the rules of navigation and a limit of speed to four miles per hour. The application of gasoline and electricity for motor power and the increasing general prosperity and recreative trend of the times, that give to many the means and the leisure to enjoy these pleasures, have multiplied the number of these boats until the year 1905 witnessed the granting of over a thousand such permits, sometimes for a single or round trip, but largely for a season's cruising in the canals. To realize what this means it should be stated that there are less than six hundred freight-carrying craft in service. While it is true that the canals belong to the people and are for their use, it is also true that they were built and maintained primarily for commercial purposes. The granting of these permits has been followed by attendant evils, induced largely by the conduct of some of the boat owners, which at times has become an overweening insolence. In some instances the raising of city bridges for the passage of pleasure boats has seriously interfered with street traffic, and in other instances, where the speed limit has been

exceeded, the banks have been so badly washed as to require expensive repairs. Section 9, article 7, of the Constitution says, in substance, that no tolls shall hereafter be imposed upon persons or property transported on canals. In the days of passenger packets, tolls were levied upon each person carried. As a regulator of this new traffic, the Superintendent raised the question whether the provision of the Constitution, subjecting all boats and their masters upon the canals to such laws and regulations as may have been or may hereafter be enacted concerning their navigation, would permit the charge of a fee for issuing permits to pleasure boats.⁶⁷

In response to requests from the people near Cayuga lake an appropriation was included in chapter 700 of the laws of 1905 for surveying a route to join that lake with the Barge canal. According to the engineer's report the most feasible plan to accomplish this result seems to be by a change in the route of the main canal between Fox Ridge and Lyons, bringing it nearer the foot of the lake. This alteration would lessen the cost of construction and maintenance of the Barge canal, as well as connect Cayuga and Seneca lakes with the main route. It would also allow a wider channel with easier navigation, besides tending to reclaim some thirty thousand acres of Montezuma marshes and to benefit the sanitary conditions along the shores of Cayuga lake, including a part of Ithaca. The disadvantage of eight miles of increased length of Barge canal would be partially offset by the higher rate of speed permissible in the wider channel. However, the change requires legislative sanction, and the project is still held in abeyance.

Before turning to the narratives of the other canals, it may be well to consider the question which is often asked concerning the cost of the canals. If the original cost or the expenses of subsequent enlargements and maintenance of each canal be desired, answers of only approximate accuracy can be given. Figures, indeed, are not wanting, but the difficulty lies in selecting the correct amount among the many varying reports. Doubtless these differences often arise from diversity in judgment in regard to the items which should constitute the total cost.

⁶⁷*Report of Superintendent of Public Works, 1905.*

Moreover, we are informed by those familiar with the subject that in the older financial accounts care was not always taken to distribute expenditures properly among the various canals. Again, under the guise of canal legislation many localities have succeeded in obtaining appropriations for certain public works, needful and proper enough in themselves, but very remotely, if at all, connected with the canals, and these amounts have been included in canal expenses. However, in the statistical part of this volume will be found an attempt to give the cost of original construction and of enlarging the several canals, together with a statement by the auditor concerning the outlay on each canal up to 1882—approximately the time of abolishing tolls. From this latter table it appears that at that time the Erie had earned \$42,599,717 more than it had cost and that the whole canal system had \$8,333,457 to its credit. If an idea is desired of the whole expenditure on all the canals, an analysis of the sheet in the Comptroller's annual report summarizing all receipts and payments will give the information. This analysis, made by the Chief of the Bureau of Canal Affairs, for the year ending September 30, 1903—the nearest fiscal division to the beginning of the Barge canal—shows that the whole system at that time had cost \$169,466,410, while the direct income from tolls, salt and other duties, water rents and miscellaneous sources reached \$144,234,120. If the amount paid for interest (reduced by the premiums and interest received) be added, the cost is increased to \$212,690,234.

To the question as to whether the canals have paid for themselves, it is interesting to notice a statement of the auditor in 1877—five years before the abolition of tolls—concerning the direct income for the forty years preceding. He declared that the tolls had then amounted to \$130,034,897, that the carriers had received \$146,868,964 and the merchants and warehousemen at least \$100,000,000 more for commissions and storage, making a total of \$376,903,861. When similar items for the other forty-five years are added, a most conservative estimate of the direct financial returns to the State and its citizens will easily place the amount at twice the cost of the canals, with all interest included. In a later chapter we shall study the more indirect benefits of these waterways to the State and to the

whole nation, especially during the earlier years. As this investigation will indicate, the beneficial effects of the canals—supplemented by railroads, for which they paved the way—in bringing wealth and prosperity to the State are almost beyond our calculation. That these indirect results cannot be set down in mere figures and that they far transcend the immediate monetary returns, is generally conceded. We have long ago thrown wide the highway of the canal, free to the commerce of the world; we need not, as did our fathers, rely upon its revenues for the necessities of the State, but through it the hand of the people rests upon the lever which controls and regulates the rates of transportation.

The foregoing pages have been devoted to an account of the Erie canal, together with much that has concerned the policy of the whole system. Much might be written of the endeavors of canal advocates and organized associations in agitating improvements before they have become crystallized in legislative enactments, but space has forbidden more than a recital of results attained. The aim has been to treat all subjects impartially, the failures as well as the successes. That errors have been made in the past has been frankly shown; that in individual instances from the very beginning men have occasionally failed in a just sense of their duties and responsibilities, must be admitted. Indeed, what public enterprise of equal magnitude and complexity has been free from them? But that the canals have generally been managed with prudence and justice and that the people of the state have continued to believe in their need and usefulness, are shown by the popular attitude, which, with but few, brief disaffections, has constantly demanded an adequate canal. And these facts constitute one of the greatest testimonials to the wisdom and patriotism of our forefathers.

We shall now consider each of the other canals in turn, but these accounts will be confined more particularly to statements of fact rather than to a discussion of policies.

CHAPTER VI.

THE CHAMPLAIN CANAL.

From the beginning of the work of construction to the present time, including the Glens Falls feeder.

The natural result of the settlement of Albany in 1624 by the Dutch and the early occupation of Canada by the French was to make the valley of the Hudson and Lake Champlain one of the most important lines of communication on the continent. When in 1760 Canada became an English colony, this line of communication became much more fully developed and began to show its effects on the intervening district. The result was that this region was thickly settled long before the western section of the state began to be developed. The natural advantages of this northern territory compared favorably with those of any other section. In lumber, mines, water-power, agriculture, grazing lands and other sources of wealth it was bountifully endowed.

In the war of independence, obstinate and continued efforts were made by the English Government to open and hold this valley for military occupation, it being well understood that its possession would be fatal to the American cause by cutting the colonies into two parts which could then be dealt with separately. It was but natural that this section, which occupied so important a position in the affairs of the State from the earliest times, should not remain silent nor be forgotten when the agitation for great internal improvements began.

The preliminary measures and operations which eventually led up to the construction of the Champlain canal were so closely affiliated with the early history of the Erie canal that it is almost impossible to treat of them separately. The account of those events prior to 1816 is given in another part of this volume in connection with the early history of the Erie canal and need not be repeated here. It will suffice to say, however, that the Northern Inland Lock Navigation Company was chartered in 1792 for the purpose of constructing a waterway between Lake Cham-

plain and the Hudson river and although over \$100,000 was spent by this company, no real progress toward this end was effected and the vast sum of money expended was practically thrown away.

As far back as 1812 the canal commissioners, although appointed merely "to explore the route of an inland navigation from Hudson's river to Lake Ontario and Lake Erie," noted in closing their report, that "a communication, by means of a canal, between Lake Champlain and Hudson's river, is one of those things which are deemed of national importance."¹ In each succeeding report the canal commissioners expressed the belief that this waterway could easily be effected, and in March, 1816, they represented to the Legislature "the expediency of adopting such preliminary measures as may be necessary for the accomplishment of this important object."²

Finally on April 17, 1816, a law was passed (chapter 237) appointing Stephen Van Rensselaer, De Witt Clinton, Samuel Young, Joseph Ellicott and Myron Holley as commissioners, "to consider, devise and adopt such measures as may or shall be requisite, to facilitate and effect the communication, by means of canals and locks, between the navigable waters of Hudson's river and Lake Erie, and the said navigable waters and Lake Champlain."³

This act marks the beginning of our active canal policy in the State, which resulted in a law authorizing the canals during the following year. The law further empowered these commissioners to employ engineers for the purpose of exploring and examining the routes which appeared to be suitable for the proposed canals, and for making maps, plans and estimates of cost. Twenty thousand dollars was appropriated for making these surveys, plans and estimates.

The canal commissioners made their report to the Legislature in regard to the feasibility of improving the navigation between Lake Champlain and the Hudson river on March 19, 1817. In pointing out a few of the advantages to be derived from the construction of a canal between these points, they mentioned the

¹*Senate Journal*, 1812, p. 121.

²*Senate Journal*, 1816, p. 101.

³*Laws of 1816*, p. 295.

immense quantity of lumber which would be conveyed on this canal. They stated that, "within that tract of country, embracing the borders of Lake George, and the timber land north and west of the great falls in Luzerne, there are annually made, and transported to the south, two millions of boards and plank; one million feet of square timber, consisting of oak, white and yellow pine, beside dock logs, scantling, and other timber to a great amount."⁴

In addition, all that territory contiguous to Lake Champlain abounded in wood, timber, masts, spars and lumber of all kinds, which, by the construction of the proposed canal, would find a ready market along the Hudson and in the City of New York, instead of being driven to a doubtful market by a long and hazardous navigation to Quebec. Most of this northern country was unfit for agricultural pursuits, as it was rough and mountainous and covered by native forests. These lands would be greatly increased in value by the construction of the proposed canal.

The iron in the northern part of the state, which was found in almost inexhaustible quantities and was of excellent quality and at that time left unworked in the mine, also the fine marble of Vermont, which lay useless in the quarry, could be converted to useful and ornamental purposes and exchanged, in the West, for salt and gypsum; and thus the large sums which were annually expended abroad for the purchase of iron, salt and gypsum, would be retained at home and added to the permanent wealth of New York State. In summing up the various advantages the commissioners said: "In short, the connection of Lake Champlain with the Hudson, by means of a canal, would greatly enhance the value of the northern lands; it would save vast sums in the price of transportation; it would open new and increasing sources of wealth; it would divert from the province of Lower Canada, and turn to the south, the profits of the trade of Lake Champlain; and, by imparting activity and enterprise to agricultural, commercial and mechanical pursuits, it would add to our industry and resources, and thereby augment the substantial wealth and prosperity of the State."⁵

⁴*Assembly Journal*, 1817, p. 588.

⁵*Id.* p. 589.

The preliminary survey for this canal was made by Col. Lewis Garin, under the direction of the canal commissioners. In his survey, Col. Garin found two favorable places of departure from the Hudson, in order to connect that river with Lake Champlain. A previous commission had reported in favor of a route which left the Hudson at the mouth of Fort Edward creek and pursued the valley of that creek to the summit level, whence it followed the course of Wood creek, making the length of this section of the Champlain canal as far as Whitehall, twenty-two miles.

Although mentioning this route as an alternative, the later commission recommended a route which left the Hudson near the mouth of Moses kill, about six miles below Fort Edward creek, and by following the natural channels of Moses kill and Dead creek reached the summit level, whence partly by following the channel of Wood creek and partly by artificial cuts, it came to Whitehall, making the distance twenty-eight miles. Both of the proposed locations were exceedingly favorable for the construction of a canal, the soil consisting for the most part of vegetable mould, loam and clay. At the northern termination of the canal some limestone excavation would be necessary by either route, but the material to be excavated would be very useful in the construction of locks, nine of which were considered necessary between the Hudson and Lake Champlain. It was proposed to extend the summit level about fifteen miles and to have it terminate about one mile south of Fort Ann. The commissioners proposed, "in order to turn off as much as possible the superfluous waters of freshets, and to insure at all times a sufficiency of water on the summit level, . . . to erect a dam across halfway brook, of eighteen feet in height, half a mile above the mouth of said brook, and by a natural ravine leading to the south, to direct so much of the water of said brook to the summit level, and from thence by several waste-weirs, into the Hudson, as may be necessary for the convenience of the canal.

"The water in the canal," they reported, "is not to be less than thirty feet wide at the surface, twenty feet at the bottom and three feet deep, and the locks to be seventy-five feet long and ten feet wide in the clear."^a

^a*Assembly Journal*, 1817, p. 590.

Continuing, the commissioners said: "From the mouth of Moses' kill it is proposed to improve the channel of the Hudson for the purposes of navigation as far south as the village of Stillwater, at the head of Stillwater falls. This may be effected in the following manner. By erecting a dam three feet in height across the Hudson, at the head of Fort Miller falls, the river above as far as Fort Edward, would at all times afford a sufficiency of water for boats drawing three feet. To overcome the descent of Fort Miller falls, a side cut or artificial canal of about one mile in length, and with two locks of 10.321 feet lift each, will be necessary. . . .

"Two and a half miles below the south end of this canal, at the head of Saratoga falls, a dam three feet in height is to be made across the river, and a side cut round the falls, similar to the above, of about one mile in length, with two locks of 6.198 feet lift each. . . .

"Thirteen miles below this place, at the head of Stillwater falls, another dam of three feet in height, will in like manner ensure a good boat navigation up to the Saratoga falls. . . .

"From the village of Stillwater, at a point above the dam last mentioned, it is proposed to cut an artificial canal to the village of Waterford, where it is to be connected with the Hudson. This canal will be supplied with water from the river at its upper end. Its length will be nearly twelve miles, and the whole descent is 76.464 feet; which will require eight locks. The excavation of this canal, for some distance near the upper end, will be considerably expensive, as it passes through a slate rock, the middle and lower parts, however, are very favorable. . . .

Recapitulation of Expenses.

From Whitehall to the Hudson,	\$250,000
Dam, side cut and other works at Fort Miller falls, .	50,000
Do. at Saratoga falls,	35,000
To Stillwater, including dam, &c.	50,000
From Stillwater to Waterford, including lockage, .	436,000
Add for contingencies, engineers, and superintendence,	50,000
Total,	<hr/> \$871,000

"Whether the canal from Lake Champlain enters the Hudson at Fort Edward creek or at Moses' kill, is not very material in the estimate of expense."

Upon receiving this exhaustive report of the canal commissioners the Legislature, on April 15, 1817, passed "an act respecting Navigable Communications, between the great western and northern lakes and the Atlantic ocean." This act authorized the canal commissioners to commence the work of opening navigable communications by means of canals and locks between Lake Champlain and the Hudson river. In all the legislative action of 1816 and 1817 the Champlain and Erie canals were treated as one measure. The details of these events are given at length in the account of the Erie.

There was some doubt in the minds of the commissioners as to whether the water-supply to be derived from Half Way brook would be ample to provide for the number of lockages that might be expected in future years, so on September 5, 1817, Mr. James Geddes commenced the reexamination of the Champlain canal. He discovered that, if such a deficiency should ever arise, the summit level could be supplied with as much water as might be desired by connecting it with the Hudson near Glens Fall's by a short feeder.

Mr. Geddes also made a survey covering all that section lying between Whitehall and Fort Edward. The first five miles south of Whitehall were staked out and the contract for this portion of the canal was let to Messrs. Melancthon Wheeler and Ezra Smith, at twelve and one-half cents per cubic yard for excavation, except a deep cutting of about thirty rods in length for which they were to receive eighteen cents per yard. This work was prosecuted vigorously until the approach of winter put a stop to it.

The dimensions of the entire Champlain canal had been changed to conform to those of the Erie. This, it was estimated, could be done without materially affecting the cost of construction, and at the same time it would greatly reduce the expense of shipping goods from the western to the northern parts of the state, as the same boats which brought the goods from the west

¹*Assembly Journal*, 1817, pp. 590-591.

could be used on the Champlain and thus cargoes would not have to be transferred to smaller boats at Waterford. The canal commissioners were of the opinion that the original estimate was liberal enough to cover even the additional expenses incurred in increasing its size to forty feet in width at the water-surface, twenty-eight feet at the bottom, and four feet in depth of water and the locks to ninety feet length by fifteen feet width. The towing-path was to be ten feet wide, except in deep cuttings where it was to be twelve feet wide, and it was to be at an elevation of not less than two nor more than five feet above the water-surface. More than half of the land required for the canal between Whitehall and Fort Edward was voluntarily ceded to the State.

In 1818 more than twelve miles of canal were completed to the satisfaction of the engineer, and material for the locks on this northern section of the Champlain canal was delivered. During the following season the locks, waste-weirs, culverts, and the remaining parts of the excavation and embankment, on the northern section, were sufficiently completed to permit water to be admitted on November 24, 1819, when it was found that both levels of this section were perfectly correct and that the locks were practically water-tight. A towing-path along the margin of Wood creek was yet to be built. The original estimate for this section between Lake Champlain and the Hudson river was \$250,000, and the enlargement of the works added about one-third to the cost of construction, which would raise the estimate to about \$333,000, but the actual cost of construction was only \$262,268.

In 1820 much was accomplished towards completing the Champlain canal. Nearly seventeen miles of excavation, extending from Saratoga falls to within ten miles of Waterford, were completed. A dam had been constructed across the Hudson at the head of Fort Miller falls, which, aided by excavations made in the bed of the river through Crocker's and Potter's reefs, had produced a boat navigation between Fort Edward and Fort Miller. The excavation of a lateral canal around Fort Miller falls and the construction of two locks at that place were progressing rapidly. The aqueduct across Fish creek and the dam above Saratoga falls were under contract and the navigation of

the northern end of the canal had been improved by straightening the channel of Wood creek.

During the season of 1821 the dam at Saratoga falls and the aqueduct across Fish creek were completed, so that the whole line of the canal to a point about one mile south of the village of Stillwater was finished before the close of the year. In the following year the finished portion of the canal extended as far south as the village of Waterford, and water had been admitted to the entire portion so that loaded boats could pass from Lake Champlain to Waterford. Owing to the swiftness of the current of Wood creek and the insufficient depth of water in this creek for two or three miles south of Fort Ann, it was found necessary to construct a dam and wooden lock to remedy these inconveniences. From Waterford to the Mohawk river work was progressing rapidly. The dam across this river below the Cohoes bridge was completed and the main line of the canal from Whitehall to the junction with the Erie was opened on September 10, 1823. The work, however, in the Hudson river between Troy and Waterford was in bad condition.

The Champlain canal was to be connected with the Hudson river at Waterford by a lateral cut with three locks. These works consisted of a dam and sloop lock. The masonry of the lock was completed in 1822, but a section of the dam had been left open in order to discharge the water of the river while the other works were being constructed. While the contractors were closing this gap, a heavy freshet occurred which undermined and carried away about one hundred and twenty feet of the unfinished dam. The high water continued so long that it was impossible to do any further work that season. In the spring of 1823 this breach was repaired, but during the season another one occurred in the old portion of the dam. In the following spring this breach became enlarged by the action of the heavy freshets and the commissioners were in a quandary as to what they should do. Finally an agreement was made with certain responsible individuals that they should repair the dam at their own expense and risk. If the dam, as repaired, should withstand the fall, winter and spring floods and at the subsiding of the water in the spring should remain entire and undamaged, the contractors were to receive the sum of \$25,750, otherwise nothing.

The dam was repaired upon these conditions and in the spring of 1825 it had withstood the test so well that it was accepted by the commissioners.

In the summer of 1820 the canal commissioners had held a meeting at Sandy Hill to consider the best means of increasing the supply of water for the summit level. They personally examined the routes of several proposed feeders from the Hudson, paying particular attention to those two leaving the Hudson, the one above Glens Falls and the other at Baker's falls. They directed an engineer to survey the routes. In the report of this engineer, it appeared that, in order to conduct the water from above Glens Falls to the summit level, a cutting of forty-five feet would necessarily be encountered. This route was, therefore, abandoned and it was decided to build a dam twenty-eight feet in height, across the Hudson about a mile and a half below Baker's falls. The contract for this dam was let and the work nearly completed when a sudden freshet on November 12, 1821, destroyed and carried away one hundred and eighty-five feet of the dam. During the suspension of work on this dam it was ascertained that an error had been committed by the engineer who first made these surveys. Five engineers, sent to reexamine the other route, agreed that it was the more advisable scheme, and they recommended the construction of a navigable feeder connecting the Hudson above Glens Falls with the summit level. The commissioners concurred in this opinion and in the spring of 1822, Mr. Canvass White was sent to lay out the new feeder. It was soon discovered, however, that the engineers, who had made their examination while there was a foot or more of snow upon the ground, had been very much deceived in the character of the excavation, the expense of the work, and the time necessary for its accomplishment. It was found that "the feeder must pass for more than a mile in length, through a rock of secondary limestone, filled with chasms and fissures, which would require considerable time and expense to make sufficiently tight to hold water, and that a considerable part of the remainder of the line, must be located upon the margin of a declivity, composed of loose and porous sand, a portion of which would probably require lining, to make it secure."⁸ The difficulties to be overcome would

⁸*Assembly Journal*, 1823, p. 506.

render it impossible to complete the feeder in one season; and the tying up of navigation for one season would result in such a great financial loss to shippers along the line of the canal that the canal commissioners passed a resolution, authorizing the repairing of the dam at Fort Edward, which had been injured in the freshet of November 12, 1821.

This work was carried to a successful completion so expeditiously that by September 1, 1822, water was running over the entire length of the dam and henceforth the Champlain canal was furnished with a superabundant supply of water. However, it was deemed advisable to construct the feeder from Glens Falls, both as a future source of water-supply for the summit level and as a means of navigable communication between Glens Falls and the Champlain canal.

In 1823 the new feeder was completed as far as Sandy Hill, but great difficulty was experienced in preventing excessive leakage. It was not entirely completed that year on account of the scarcity of funds for the purpose. It was expected that the Glens Falls feeder would be completed by September 1, 1827, according to the contract, but it dragged along into the following summer and was not in good navigable condition until 1829. The law for the construction of the feeder prescribed wooden locks to overcome a lockage of over one hundred and thirty feet.

During the year 1824 numerous petitions were received by the Legislature from sundry inhabitants of Rensselaer, Saratoga, Washington, Warren, Essex, Clinton and Franklin counties in relation to the navigation of the Champlain canal from Fort Edward to Fort Miller, representing "*That experience has already demonstrated the fact, that by using the bed of the Hudson river, between Fort Edward and Saratoga falls, as a substitute for canal navigation, transportation is at all times tedious and expensive, and during periods of floods and of high winds is wholly interrupted*"; and the petitioners asserted "*that the expense of transportation between Lake Champlain and Troy, during the last season, has been greater on the short distance between Fort Edward and the Saratoga cut, than it has been upon the whole line of the canal which embraces the residue of the distance.*"^a Inasmuch as these representations of the peti-

^a*Senate Journal*, 1824, pp. 272-3.

tioners seemed to be well founded, a concurrent resolution was passed requiring the canal commissioners to make "such alterations and improvements in the northern canal, between Fort Edward and Fort Miller, as in their opinion is necessary, to make a fair and perfect canal navigation."¹⁰ In accordance with this resolution, passed on April 10, 1824, this route was carefully surveyed and the length of the proposed line of canal was found to be about eight miles, and the nature of the ground was found favorable for the construction of a canal. The successful completion of this canal would not, however, entirely obviate all dangers, for it would still be necessary to use the bed of the river for about two and one-half miles below Fort Miller, and it would also be extremely difficult to maintain a tow-path on the bank of the river at this place in consequence of the lowness of the banks and the sandy nature of the soil.

The commissioners accordingly recommended this extension of the proposed canal and suggested that provisions be made for crossing the river either on an aqueduct just below the Saratoga dam or by locking into the pool above this dam and crossing on a towing-path bridge. On April 20, 1825, a law (chapter 277) was passed authorizing the canal commissioners "to make or cause to be made such alterations and improvements in the Champlain canal, between Fort Edward and the dam above Saratoga falls on the Hudson river, as the said commissioners may think necessary to form a canal navigation: *Provided*, That the expense . . . shall not exceed one hundred and seventy thousand dollars: *And provided further*, That the said commissioners shall not construct . . . any aqueduct over or across the Hudson river."¹¹ Contracts for this work were let in July, 1825, on terms very favorable to the State. This section of the canal was ten miles and forty-four chains long and it had four locks, rising thirty-six and one-half feet, seven culverts and thirty-nine bridges, including the towing-path bridge across the Hudson. Most of this work was completed in 1826, but some trouble was experienced from the sliding of banks and in some places the canal was moved a little farther into the hill, thereby delaying the opening of this section until late in the season of 1827.

¹⁰*Senate Journal*, 1824, p. 402.

¹¹*Laws of 1825*, p. 400.

Quite extensive repairs were made on the Champlain canal in 1829; three locks at Fort Ann were rebuilt, and it was found that the timber, in the ends of the dam across the Hudson at Fort Edward, which came in contact with the earth, was in such a state of decay as to render the dam insecure. A substantial dock, filled with stone, was erected at the ends and this made the dam secure. The feeder, leaving the Hudson at the Fort Edward dam, received a great deal of attention this year; a wooden guard-lock was constructed where it left the river, and the feeder itself was enlarged and its banks were secured by piling.

Upon the completion of independent canal navigation between Fort Edward and Fort Miller, it seemed advisable to tear down the dam across the Hudson at Fort Miller, and thereby escape various claims for land damages to which the State would be subjected by the continued maintenance of the dam. This was partially done but certain milling interests, dependent for their power on this dam, secured the passage of a law requiring the canal commissioners to replace those portions of the dam that had been removed.

During the season of 1832 the guard-lock at Saratoga falls and also the one on the north side of the Mohawk river were rebuilt of stone in a very substantial manner. In the year 1833 a dam was built across the Mohawk river, a short distance below the Cohoes falls. This dam was constructed of hard wood, with solid masonry abutments and was considered a fine piece of work. It was found necessary to enlarge the Moses kill aqueduct, the trunk of which was in bad condition, in order that it might accommodate two boats at once. During the years 1833 and 1834 the water in the Hudson was very low and the leakage in the Fort Edward dam was so great that had it not been for the Glens Falls feeder, which furnished an ample supply of water, navigation would have necessarily been suspended on the summit level for a great part of the season.

In the fall of 1834, Mr. Holmes Hutchinson was appointed by the canal commissioners to make an examination of the Glens Falls feeder, and an estimate of the expense of improving it so as to make it both a navigable canal and an adequate feeder for the Champlain. In his report he suggested that the dam across

the Hudson should be rebuilt with good stone abutments and that the entrance to the feeder should be protected by a guard-lock of hammered-stone masonry; that the feeder should be widened so as to give a surface width of thirty-two feet in rock excavation, and thirty-six feet in earth; and that, as the locks were decayed, they should be rebuilt of hammered-stone masonry, laid in cement, with sluices to conduct the water around them. The expense of putting this feeder in first-class condition was estimated by Mr. Hutchinson at \$127,829.62. As the Legislature did not act on this report during the session of 1835, nothing was done toward making these changes except the construction of the guard-lock at the head of the feeder.

On May 25, 1836, the Legislature passed an act (chapter 453), authorizing the canal commissioners "to alter the Glen's-Falls feeder, pursuant to the report heretofore made to said commissioners by Holmes Hutchinson, or in such other manner as said commissioners shall deem calculated best to promote the public interest; and shall, if deemed proper by them, construct the locks on said feeder with stone."¹² The plan adopted for this work was substantially that recommended by Mr. Hutchinson. Twelve locks were to be rebuilt, one combination of five locks, one of two locks and five single locks. These locks were "to be fifteen feet wide at the lower top water line within the chamber, and one hundred feet long between the upper and lower quoins."¹³ The widening of the feeder was deferred until a later time. All work on the Glens Falls feeder was put under the personal supervision of Mr. James Walker, as resident engineer. Three of these locks were completed in 1837 and the rest in the spring of 1839. They were constructed in a firm, durable manner of stone brought from the Kingsbury quarries. In connection with the construction of these locks, sluices were built around the structures in order to continually supply the summit level of the Champlain canal with water.

While the Glens Falls feeder was undergoing repairs, great trouble was experienced in maintaining the summit level of the canal, due to the leaky condition of Fort Edward dam. Temporary repairs were made to the dam, and as soon as the improve-

¹²*Laws of 1836*, p. 696.

¹³*Assembly Documents*, 1837, No. 73, p. 30.

ments to the feeder were completed, so that a supply of water for the summit level could be safely relied upon from that source, the dam was scuttled, the water drawn off and the imperfections of the dam were thoroughly repaired.

In the year 1837, a new lock of hammer-dressed stone was built on the west side of the old wooden lock, opposite the dam across Wood creek. In the following year the wooden aqueduct, by means of which the canal crossed Fort Edward creek, was replaced by a culvert of substantial hydraulic masonry.

The towing-path wall at Whitehall, commenced in 1835, and designed to protect the canal at that place from the violence of the floods of Wood creek, and to guard against breaches in the towing-path bank, which had long been a fruitful source of expense, as well as a hindrance to navigation, was completed in 1839. The canal, which previously was too narrow above the locks to admit of boats turning around, was widened by the construction of this wall, and ample space was given for the mooring and turning of boats, at a place where these conveniences were very much needed. The wall itself was eight hundred and forty feet long, from twelve to eighteen feet in height and of sufficient width on the top to form a convenient towing-path. The whole wall was built of solid hammer-dressed stone, laid in hydraulic cement and founded upon the solid rock.

During the spring of 1840 two locks known as the "Flynn Lock" and the "Moses Kill Lock," were constructed of masonry under the direction of the canal commissioners. Aqueducts across Fish creek and the Moses kill were also completed about the same time.

In the original construction of the Champlain canal no precautions were taken for preventing the wearing away of the banks of the canal. Owing to the fact that the canal followed the bed of Wood creek for several miles, its course was an almost continuous series of curves, rendering its banks especially liable to be eaten away by the current. After the canal had been opened for a few years, the necessity of providing some protection to the banks was clearly seen, and a docking of wood was tried. This, however, soon decayed and was thrown out of place by frosts or by the washing out of the dirt from behind the docking. On several short portions of the line slope wall had been laid,

but this had been imperfectly done, the stone being small and the bed too nearly vertical to ensure its being permanent. In 1840 it was finally decided that a permanent and durable slope wall could be built of large stone on this canal nearly as cheaply as a docking of wood. While navigation was suspended during the following winter nearly seven miles of this slope wall was built at an average cost of about one thousand dollars per mile.

During most of August and September, 1840, navigation was wholly suspended on the Glens Falls feeder, owing to the fact that the Fort Edward dam was so defective that all the water for the summit level had to be drawn through the Glens Falls feeder. The sectional area of this feeder was not large enough to permit all the water required to feed the summit level of the canal to pass through it, and at the same time to maintain a navigable depth, even if it were tight. It was ascertained, moreover, by actual measurements, that over half the water admitted at the head of the feeder was lost before it reached the Champlain canal. In view of these facts the canal commissioners had surveys and estimates made by Mr. Charles A. Olmstead, engineer on the Champlain canal, for three different methods of remedying the existing scarcity of water. The three plans proposed were: first, to repair or rebuild the Fort Edward dam; second, to continue the feeder from the Fort Edward dam up to Baker's falls and to construct a dam at that point; third, to tighten the Glens Falls feeder and to enlarge it, if it should be deemed necessary.

Mr. Olmstead estimated that the Glens Falls feeder could be repaired for \$74,204.41 and both he and the canal commissioners recommended that this was by far the most feasible plan. The Legislature accordingly acted upon this recommendation and passed an act (chapter 111, Laws of 1841), appropriating \$75,000 for the improvement of the Glens Falls feeder. This work was all under contract by July 31 of that year. During the progress of this work the canal received its supply of water from the Fort Edward creek. The improvements made under this act consisted in enlarging the prism of the feeder, in widening and deepening the channel of ingress above the lock at the feeder dam, and in constructing stone sluices in place of the old wooden ones around the locks. The contracts for these improvements were all completed by June, 1842.

On the thirteenth of October of that year a careful measurement of the quantity of water admitted into the feeder through the locks at the dam, and of that discharged by it into the Champlain canal was made, with the following results:

Quantity admitted, cubic feet per minute.....	13,875
Quantity discharged into Champlain canal, cubic feet per minute	6,001
<hr/>	
Quantity lost by leakage and evaporation, cubic feet per minute	7,874
<hr/>	

This large amount of water was nearly all lost in the rock section which extended for a mile and a half through and below the village of Glens Falls. It was found that this leakage could be diminished by lining this section with fine gravel. This method was used for several years with fairly good results. Above the village of Glens Falls the feeder was cut through a fine, loose sand. To prevent this from being washed into the canal it was found necessary to protect the banks with "rubbish stone," which could be obtained without expense at Glens Falls and was practically as serviceable as slope wall.

In 1842 the new lock at Fort Miller was completed. During the previous year a contract was let for the construction of a new stone lock to take the place of the "Becker Lock" near Stillwater. As this lock had been partially rebuilt in 1835, it was thought that it could be put in shape to last several years longer at moderate expense. Work on the new lock was suspended, therefore, since the act of March 29, 1842, stopped all work on the canals of the State not immediately necessary. A new lock north of Waterford was also brought into use in the spring of 1842.

In the winter of 1843 a pier was constructed in the channel of Wood creek at the side of the locks at Whitehall. The pier was "two hundred and sixteen feet in length, extending into the lake twelve feet below the lower lock walls, ten feet wide at the north end and terminating in a point at the south and is fifteen feet in height."¹⁴ It was a substantial structure and was planned to facilitate access to the locks from the lake, in high water, and to serve as a protection to the locks from the freshets in Wood

¹⁴*Assembly Documents*, 1844, No. 16, p. 60.

creek. As the old dam and feeder at Fort Edward were no longer required as a means of water-supply for the Champlain canal, a portion of the dam, one hundred feet long and ten or twelve feet deep, was removed in order to reduce the liability of the failure of the dam at the time of river freshets.

The Saratoga towing-path bridge across the Hudson river was carried away by a flood in the spring of 1843. Instead of rebuilding this bridge, the canal board made an agreement with the Fort Miller Bridge Company, which was about to put up a road bridge at practically the same place, to construct, for the sole use of the State, a towing-path, connected with their road bridge, and to keep it in repair for an annual consideration of \$400. The Troy dam required extensive repairs that year. These repairs consisted mainly in sinking cribs of timber in the deep water below the dam and filling them with stone. As an added precaution towards insuring a sufficiency of water in the Glens Falls feeder, the dam across the Hudson at its head was raised about eighteen inches during this year.

In the year 1844, lock No. 3 above Waterford underwent thorough repairs. The head and entire west wall were relaid and one complete new set of gates was put in place. The culvert at Mechanicville was repaired by putting in new ring stones and by constructing a parapet wall, which was necessary to support the embankment. During this same year the aqueduct across Fish creek at Schuylerville was rebuilt, having a new abutment and wings built of masonry on a pile foundation. The trunk of the aqueduct was enlarged so as to permit two boats to pass in it. The dam across the Hudson at Saratoga was raised and planked, and a new apron was constructed in 1844.

In the following year a new change bridge was constructed at the junction of the Erie and Champlain canals. New gates were put in at the guard-lock at Waterford and at the discharge-lock at Fort Miller. The old wooden guard-lock, five miles south of Whitehall, where the canal leaves Wood creek, had become so much impaired and weakened as to endanger navigation, and the canal commissioners decided to replace it with a new stone structure. A new stone dam was erected across Wood creek near this lock. Gates, large enough to take care of the flood waters of this creek in freshets, were provided, as it was planned to permanently

close both of the other channels of Wood creek near this place. Four miles of slope wall of quarried stone were built north of Fort Edward and about the same amount, made of field stone, was laid south of that place.

Very little work was required on the Champlain canal in 1846; the side-cut locks at Fort Miller were rebuilt; a large amount of slope wall was laid above Fort Edward, and a new waste-weir was built at Flynn's lock. On the feeder some work was required; a new waste-weir of stone was built at Cornell's, about half way between Sandy Hill and Glens Falls, to regulate the quantity of water as it passed down to the locks; about three hundred feet of cement wall were laid on the berme side of the feeder at Glens Falls to prevent the escape of water through the fissures of the rock into the river; the guard-lock at the head of the feeder was rebuilt; the feeder dam strengthened, and the towing-path improved.

In the following year the lock known as "Becker's Lock," near Stillwater, was taken up and rebuilt, while the work of preventing the escape of water through the berme bank of the feeder into the Hudson was carried on quite extensively.

In the year 1848 the waste-weir at Wilbur's basin gave way during a severe thunder storm. This was considered the strongest and most durable structure on the canal and its failure could be accounted for only by assuming that it was struck by lightning. This was thoroughly repaired and the old wooden culvert, where the Glens Falls feeder crossed Cold brook, was replaced by one constructed of stone. The east wall of one of the Whitehall locks was also rebuilt.

In 1849 a new stone lock was built about one mile above the village of Waterford. Quite extensive repairs were made to the Mohawk, Saratoga, and Feeder dams. It seemed advisable to the canal board to close the old Fort Miller side-cut, which was no longer of any service in passing boats from the canal to the river, and which was a constant drain for water from the canal except during extreme high water in the river. They accordingly directed the commissioners to close the side-cut by an embankment at a point where the State had for some time maintained a bridge over the cut.

On March 16, 1850, the Assembly committee on canals made a report on "the expediency of enlarging the Champlain canal to the size of a ship canal."¹⁵ While recognizing the great benefits to be derived from the proposed improvements, in the event of the construction of a ship canal to connect the waters of Lake Champlain with the St. Lawrence river, the committee did not recommend that any active steps should be taken at that time towards enlarging the Champlain canal for the following reasons:

"1. The uncertainty when the Champlain and St. Lawrence canal will be completed.

"2. This improvement cannot be made without an outlay of \$3,000,000 or more.

"3. The revenues of this State were pledged by the Constitution to the specific object which will require several years to comply with its requirements."¹⁶

In the year 1850 one lock was constructed a few miles north of Waterford and contracts were let for reconstructing the combined locks at Whitehall. As rebuilt, these locks were made of the enlarged size of one hundred feet and their number reduced from three to two. At that time all lift-locks, except the combined locks at Whitehall (under contract) and the two locks just north of the junction near Cohoes, had been enlarged to one hundred feet in length. The trade on this canal was rapidly increasing. In July, 1849, 86,398,475 feet B. M. of sawed lumber were cleared at Whitehall, while in 1850 this item alone jumped to 138,091,513 feet B. M.

In the following year a waste-weir was rebuilt near the village of Whitehall. The Fort Miller dam, in regard to which there had been so much ill feeling between the mill owners at Fort Miller and the citizens owning land abutting on the river north of the dam, was removed by direction of the canal board.

In 1852 the contract for rebuilding the combined locks at Whitehall was declared abandoned. It was later proposed to increase the size of these locks so as to permit of locking two boats at the same time. Lock No. 7 at Waterford was rebuilt during this year and a pier was built on the lower side of the dam at the

¹⁵*Assembly Documents*, No. 120, 1850, p. 1.

¹⁶*Id.* p. 16.

head of the Glens Falls feeder. A proposition was at this time submitted to the Legislature to construct the locks upon the Champlain canal, when new structures should be built, of the size of the enlarged locks upon the Erie canal. This proposition was not acted upon immediately, although by chapter 620, Laws of 1853, it was tried on the combined locks at Whitehall, the contracts for the reconstruction of which had been dragging along for several years. These locks had been previously put under contract twice for rebuilding of the ordinary size and both contracts had been abandoned. By this act \$10,000 was appropriated towards the additional cost of rebuilding them of the size of the locks of the enlarged Erie canal. On October 17, 1853, these locks were put under contract to be rebuilt of the enlarged size. At this time it was decided to be for the best interests of the State to change somewhat the location of these locks and to go back to the old scheme of three combined locks of nine or ten feet lift instead of two of fourteen feet lift. Finally it was provided by the amendment of the Constitution, which was ratified by the people of the State on February 15, 1854, to enlarge the locks of the Champlain canal to the size of those on the enlarged Erie canal, whenever from dilapidation or decay it should be necessary to rebuild them. During that year the Legislature appropriated "\$25,000 for the expense of enlarging the locks . . . beyond the cost of reconstructing them of their present dimensions."¹⁷ Upon examination of the various locks on this canal the three single locks located at Fort Ann were found to require immediate rebuilding. A survey was made and "it was found best to adopt a new location for the canal for about a quarter of a mile at this place, and locate one single lock and two combined locks, and by this means get a more direct and better shaped canal, and very materially increase the reaches between the locks, which, in the old canal, were very short, not giving sufficient basin for water to fill the lock below."¹⁸ This work was put under contract July 6, 1854, to be completed April 1, 1856. It was also found necessary to rebuild the three single locks on the Waterford side-cut. On December 20, 1854, these locks were put under contract to be

¹⁷*Laws of 1854* (chapter 330), p. 700.

¹⁸*Assembly Documents*, 1856, No. 50 (State Engineer's Report for 1855), p. 49.

built in the form of three combined locks on the north side of the old side-cut.

In the following year the contract was let for rebuilding the lock at the north end of the Saratoga dam, of the enlarged size. In July, 1854, the dam across the Hudson at Glens Falls was found to be in such a condition as to require immediate repairs to prevent its entire destruction. It was secured by the construction of a pier of timber and stone, below the dam. During the following winter and spring it was found necessary to rebuild the Moses kill aqueduct, which had been in a dangerous condition for some time.

In 1856 the old wooden lock on the Glens Falls feeder was removed and a new one constructed. The Champlain canal was now proving itself to be the principal and most productive of all the lateral canals in our system of internal improvements. On the completion of the enlargement of the ten locks then under construction, an increase in capacity of twenty per cent of the tonnage of boats would be obtained, provided that the two junction locks below Cohoes and the north guard-lock at the Mohawk river were rebuilt. The further cost of enlarging the prism, to give a capacity of sixty feet width and six feet depth of water, would be small in comparison with the benefit it would give to all the interests connected with transportation. While many of the locks had been enlarged, they did not in the least affect the capacity of the canal, until the prism itself was proportionately enlarged. The prism had been allowed to fill up for years. Instead of cleaning and dredging out the bottom of the canal when the banks had been washed in, the custom of repairing the Champlain canal had been to merely raise the banks a little higher. The result was that at this time the canal was practically worn out by the great amount of business it had been required to perform, and from the want of proper care and attention in keeping its original proportions and levels. Since the reciprocity treaty between the United States and Canada, trade between the two countries had assumed such proportions that the Champlain canal was wholly inadequate to accommodate it, so that in February, 1857, the canal commissioners recommended that it should be enlarged to the size of the Erie canal.

In 1857 the Saratoga dam was thoroughly repaired by the construction of massive crib work. Two years later no progress had

been made towards the enlargement of the canal further than a request by the Legislature for the State Engineer to estimate the cost of deepening the Champlain canal for five feet depth of water. The State Engineer reported that the plan was feasible and that it would cost about \$167,645. The additional cost of stopping the leaks and providing a depth of five feet of water in the Glens Falls feeder was estimated at \$52,690.

In 1859 contracts were let for rebuilding and enlarging three more locks, two combined locks near the old junction with the Erie canal below Cohoes, and one on the north side of the Mohawk river at that place. In March of that year the Fort Miller bridge, which was used as a towing-path bridge for crossing the Hudson river above the Saratoga dam, was carried away by an extraordinary freshet and teams had to be ferried across the Hudson during the following season.

By chapter 213, passed April 9, 1860, provision was made for the long proposed improvement and enlargement of the Champlain canal and the Glens Falls feeder, so as to give for their entire length a depth of five feet of water and a uniform width of thirty-five feet on the bottom, "or as near these proportions as in the opinion of the Canal Board may be deemed judicious." This act also provided for rebuilding the residue of the locks on the canal (as soon as they might be required by the demands of navigation) and for the stoppage of all leaks in the Glens Falls feeder, and carried with it an appropriation of \$170,000. The first contracts let under this act provided for raising the banks of the canal from the junction of the Erie canal to the foot of the combined locks, for rebuilding Bassett's lock on the enlarged plan, and for driving piles on the sixteen and five-mile levels for protection of side-hills and banks.

In 1861 these contracts were finished and others let for the reconstruction of the south guard-lock at Cohoes, Parish lock No. 17 on Wood creek, and a weigh-lock and weigh-master's office at Waterford. A weigh-lock had long been needed at Waterford as up to that time the only one available for weighing boats on the Champlain canal was at West Troy on the Erie canal. The Waterford side-cut had served as a convenient shunpike to any boats that were not bound to points on the Erie canal, and consequently the State had been defrauded of a large percentage of its just

tolls. In addition, the pressure upon the weigh-lock at West Troy, due to weighing all the boats passing to or from the Erie canal, was such as to cause delays that were inconvenient and prejudicial to the interests of boating men and shippers.

In 1862, when there appeared to be some prospect of war with Great Britain, the states bordering on the great lakes were greatly worried by the thought of the consequences of such a war. Shortly after the treaty of Ghent, a supplementary treaty was made between the United States and Great Britain stipulating that the naval force to be maintained by each Government on the bordering inland lakes should be confined to one boat on each of Lakes Ontario and Champlain and two boats on each of the upper Great Lakes, and that these vessels could not exceed one hundred tons burden nor have an armament greater than one eighteen-pound cannon. The United States would have no way of bringing warships to the lakes to protect the many wealthy and prosperous cities along their shores, while Great Britain had so improved her waterways that she could bring a large fleet of warships up the St. Lawrence and have all our coast cities at her mercy. It was then proposed to enlarge the Erie, Oswego and Champlain canals and locks, so as to permit the passage of boats adequate to the defence of the northern and north-western lakes. The Legislature, contemplating the enlarging of one tier of locks on the Erie, Oswego and Champlain canals, ordered what has been known as the "Survey for Gunboat Locks." On account of limited funds, the canal board dispensed with surveys along the Champlain route, but from data at hand it was estimated that the expense of enlarging the locks of this canal to the proposed dimensions—one hundred and fifty feet in length and twenty-five feet in width—would be \$815,000, or enlarging the prism and other mechanical structures to the same size as the existing Erie canal would be \$3,770,190. New York State passed an act authorizing the construction of this work, provided that the Federal Government would provide all the money required for the improvement, but the United States Treasury was so drained by the war of the Rebellion, then in progress, that nothing ever came of the project.

During the summer of 1862, the dam across the Mohawk river at Cohoes was raised eighteen inches, thereby obviating the diffi-

culties which had been experienced during low water, both in towing boats across the river and in maintaining the levels on each side of the river. The weigh-lock at Waterford was also completed this year and it proved to be the most useful weigh-lock on the canals, being of great benefit to navigation on the Erie, by relieving the West Troy weigh-lock of all the boats that came from the Champlain canal, and permitting all boats that desired, to pass into the Hudson river at Waterford. During this year a stone dam was built across Wood creek at Parish lock. Upon the completion of the enlargement of Parish lock in 1863 the Fort Edward lock was put under contract.

Up to this time practically all of the appropriation authorized by chapter 213, Laws of 1860, had been expended in enlarging locks or in stopping leaks in the Glens Falls feeder, and consequently the canal was not able to accommodate any larger boats than before. Every lock and also the entire prism had to be enlarged before any benefit could be derived from those parts that had already been enlarged, and if this were not done the money already expended was almost thrown away. The prism of the canal was too small for the class and tonnage of boats then coming into use. The banks were generally too low for the quantity of water they were required to sustain, and in the event of sudden rain-storms it was a common thing for them to be overflowed. Loaded boats required a bottom width in the canal of at least twenty-nine feet to permit of passing each other, and, as the average bottom width was then only about twenty-six feet, the boatmen experienced many vexatious difficulties and annoyances.

Following out these ideas, on April 15, 1864, the Legislature appropriated \$295,000 to be expended in improving both the Champlain canal and the Glens Falls feeder, so as to make them thirty-five feet wide upon the bottom and five feet in depth. The act also provided for stopping leaks in the feeder. The first contracts let on December 18, 1865, under this act were for improving the canal at Stillwater, Bemis Heights and at the Waterford weigh-lock, for enlarging the Schuylerville aqueduct and for building sluices around the guard-locks at Cohoes and at Saratoga dam. In the following year the enlargement of the Moses kill lock was begun and also all the remaining work authorized under the

appropriation of 1864, with the exception of raising a part of the towing-path along Wood creek. In 1866 the funds for improving the Champlain canal and feeder were increased by an appropriation of \$247,500.

In 1867 the rebuilding of the Fort Miller lock to one of the enlarged size was placed under contract by the canal board. By chapter 579 of this same year, provision was made for rebuilding with stone the State dam in the Mohawk river at Cohoes. During this season the improvements from Cohoes to the Saratoga dam were practically completed. The work that remained to be done consisted for the most part in raising and grading the tow-path from the Fort Miller bridge to Fort Ann, and in the building of docking and vertical or slope walls, where absolutely necessary. The value of the improvements already made was shown by the fact that the tonnage of the Champlain canal for 1867 showed an increase of 46,000 tons over the previous year and that the tolls for the fiscal year 1868 amounted to \$204,118. By increasing the capacity of the prism to correspond with the size of the enlarged locks, it was thought that a more than proportionate increase of business would be the immediate result.

On February 9, 1870, after the State Engineer and Surveyor and the canal commissioners had for several years recommended the enlargement of the prism of the Champlain canal so as to give seven feet depth of water, and not less than forty-four feet width of base of prism and fifty-eight feet breadth at water-line, the State Engineer made an estimate, in accordance with a resolution of the Assembly, of the cost of the proposed enlargement. The total estimate as prepared by him amounted to \$3,200,000.

At this time the Champlain canal was indeed in a very poor condition to accommodate the rapidly increasing trade that was dependent upon it. In 1834 the Erie enlargement was initiated and carried on year by year. In the meantime the State had made ten additional canal improvements west of the Hudson. To the original cost of the Erie canal—a little over \$7,000,000—about \$45,000,000 had been added; about \$34,000,000 had been expended on other canals, but the Champlain had been little improved for actual operation, beyond its original state, and consequently its district had suffered, while all the others had been

greatly improved. Since 1827 the structures of the Champlain canal had been improved from time to time, and more recently the line below Waterford had been adapted to the use of enlarged Erie canal boats, while the prism depth had been increased to five feet on the sections above Waterford, but this canal had not been included in the general enlargement laws and no systematic improvement had been made on the scale of the Erie improvement. Of the renewed locks, bridges and other structures, no common standard of enlargement seems to have been adopted until about this time. The deplorable result was, that, with a heavy account of expenditures for repairs, the canal was but little improved over its original capacity and could not accommodate the business which properly belonged to it at this time. The Champlain canal was the natural channel through which all of the products of the vast northern section of the state should pass, but its incapacity was such as to cause large amounts of these products to seek other outlets. In view of existing conditions, it seemed to be the duty of the State, by providing facilities for cheap transportation and an increased volume of trade, to be prepared for the rapid development of the agricultural, manufacturing and mineral resources of northern New York at that time in progress, and also to invite and intercept into this State its due share of the constantly increasing domestic and export trade of Montreal and its commercial tributaries. Consequently, by chapter 788, Laws of 1870, the Legislature passed an act appropriating \$25,000 for the purpose of making the necessary surveys, maps, plans and estimates for enlarging the Champlain canal. The estimate, made as a result of this survey, was \$2,850,574.72. A survey was also made for the purpose of locating an independent line of canal, outside of Wood creek, extending from the lower lock at Fort Ann village to the guard-lock north, a distance of six miles. This line would be free from the constant annoyances and delays occasioned by high water, it would be much less expensive to maintain, and would possess many other advantages. The adoption of this line would increase the other estimate by \$283,625.

A little earlier (1866) a survey had been made of the "Hudson slack-water navigation from Troy to Fort Edward, and also of the Champlain canal, from the Erie canal junction to Whitehall,

to ascertain the feasibility and expense of such slack-water navigation, with a canal enlargement to Whitehall, and the comparative expense of the canal enlargement from the Erie canal junction to the size of the Erie canal in prism, with gunboat locks, chambers 225 by 25 feet in length and width."¹⁹ The report of this survey treats very fully of the various investigations and improvements along the valleys of the Hudson and Champlain, and urges in strongest terms the adoption of one of the proposed plans. The estimates of cost were: on the plan of river improvement, with slack-water navigation for 39.8 miles and enlarged canal for 25.11 miles, a depth of not less than eight feet of water, giving a navigation for vessels of thirty feet beam from New York City to Whitehall, \$4,534,379; on the plan of canal enlargement for a length of 64.79 miles, with a depth of seven feet of water, giving a navigation for vessels of twenty-four and a half feet beam from the Erie canal junction to Whitehall, and thence to Montreal, \$5,866,851. Even at this early day the best argument that the opponents of the enlargement could bring forward was that, before the work could be completed, a ship canal might be necessary from Whitehall to Albany.

The same law of 1870, which appropriated \$25,000 for the survey for enlargement, provided for raising \$400,000 in 1871 to carry on the work of enlarging the Champlain canal so as to give throughout the entire length a uniform depth of seven feet of water, a width of forty-four feet on the bottom and fifty-eight feet at water-surface. Under the laws of 1871, the canal commissioners put under contract two locks which were to replace the "Three Locks" above Waterford.

In 1872 seven contracts, covering some of the worst and narrowest places on the canal, were let. Although the Legislature at its next session (1873) passed a bill appropriating \$500,000 for carrying on this work, the bill failed to receive the Governor's signature on account of some legal technicality. On this account, all work on the enlargement was necessarily suspended during 1873, but the Legislature of 1874 appropriated \$500,000 to be available in the spring of 1875, for the continuation of this enterprise. Work was not commenced as authorized by this appro-

¹⁹*Assembly Documents*, 1868, No. 23 (State Engineer's Annual Report for 1867), p. 28.

priation, and in 1876 a law was passed modifying the plans of enlargement. Under the new law the depth was to be only six feet, which was to be secured by bottoming out the prism and by raising and strengthening the banks. This law was passed after it had become evident from the failing revenues of the canals and from the manifest disaffection of the people, that the State would not provide sufficient money for the completion of the enlargement to the seven-foot depth, and it was thought better to secure a uniform depth of six feet than varying depths of from five to seven feet. These were the years of popular agitation which led to the abandonment of several lateral canals, the spirit of retrenchment was abroad and the public mind was in no condition to favor large expenditures. In spending this appropriation, precautions were taken to put the canal in such condition as to require the least possible expense for several years to come. Bridges were repaired, a large amount of dredging was done, widening and deepening the channel in many places, removing old coffer-dams and bottoms of old locks, and thus the channel of the canal was very much improved. These improvements resulted in giving the Champlain canal the best navigation ever known in its history, although a uniform depth of six feet was not secured.

In 1880 only about half of the appropriation of 1874 had been expended and the remainder was reappropriated for the same object, but still nothing was done until 1883, when contracts were let for widening and improving the canal in various places. In consequence of increasing the depth of the canal, the water was gradually but constantly encroaching on the banks, thus narrowing the tow-path and endangering the stability of the embankments, and also filling in the bottom of the canal and thereby decreasing the depth of water.

During 1884 and 1885 many needed improvements were made, such as the building of culverts, waste-weirs, vertical and slope walls, bridges, abutments, straightening out curves, bottoming out canal and other general repairs. In 1886 a bad bend was removed from the canal at what was known as "Woodchuck Bend," about two miles north of Fort Edward. At this point the canal was widened about thirty feet and five hundred feet of slope wall was built to protect the towing-path.

During the following winter the Legislature began making a new series of annual appropriations for the improvement of the Champlain canal. The work contemplated in this improvement consisted in carrying out the plan of obtaining a uniform depth of six feet throughout the entire canal; of widening the canal so as to obtain a width of forty-four feet on the bottom where this width could be obtained without changing the existing foot of slope on the tow-path side or weakening the berme embankments; and of protecting the slope on the tow-path side, where it was not already protected, by placing a layer of quarry chips on the slope from a point about two feet below the water-surface to the top of the towing-path, over the entire length of the improvement. The first appropriation for this object was \$70,000, which was followed by others in 1888 and 1889 of \$105,000 and \$130,000, respectively, with some additional allowance for the improvement of the Glens Falls feeder.

In 1887 the weigh-lock at Waterford failed to give good satisfaction, but it worked very well after lengthening the cradle about four feet. Upon the completion of the work called for by the contracts let in 1889, there were about twenty miles of enlarged prism, out of the total sixty-six miles of the Champlain canal, not including those portions of Wood creek which required no improvement. The improved canal embraced in these twenty miles was, for the most part, in small sections, scattered throughout the entire length of the canal, wherever navigation had seemed to be most difficult. The exact location of these improvements is given in the annual reports of the State Engineer and Surveyor for the years 1888-91. In continuation of their policy, the Legislature appropriated \$110,000 in 1890 (chapter 168) for the purpose of further improvement.

In his annual report for 1891, the State Engineer estimated the cost of completing the contemplated enlargement at from \$1,000,000 to \$1,200,000. He recommended that three sections of the canal should receive immediate improvement, these sections being: the "three and one-half miles of canal extending from lock No. 6 to lock No. 7; the two and one-quarter miles extending from Bemis Heights to Wilbur's Basin; and the three-quarters of a mile between Salisbury's culvert and Searle's waste-weir." On the completion of the enlargement at these three places, he stated

that it would "probably be wise and practical to begin work at one end of the canal and prosecute it continuously until the enlarged prism was obtained for its entire length."

No provisions were made for carrying on the improvement of the Champlain canal for the next two years, but in 1893 a small appropriation of \$50,000 was made for this purpose, and one of \$90,000 for repairing the dam across the Mohawk river at Cohoes. A new steel apron was constructed at this dam and quite extensive repairs were made. In the following year another small appropriation of \$56,000 was made for enlarging the canal, but a new era in canal history was about to begin.

People were coming to realize that the old system of small appropriations and gradual improvements was neither wise nor economical. No advantages could be derived from an enlargement until every structure on the canal was completely enlarged, for boats of increased size could not be used until the improvements were entirely finished, and before this end was reached the people were usually discouraged by the number of annual appropriations already made, without obtaining any apparent results. It usually happened that appropriations would be discontinued before the enlargement was completed, with the result that little good was derived from the expenditure of large sums. In order to obviate this difficulty, which had so frequently upset the plans for great canal improvements, the only practical way seemed to be to make a single appropriation large enough to cover all the expenses of enlarging the canals. In the words of Campbell W. Adams, the State Engineer and Surveyor, in his annual report of January 25, 1895, where he speaks of the project of enlarging the Erie, Champlain and Oswego canals, "the first great step to be taken is to definitely settle on some general plan, broad enough to accomplish the one object of making ours the most attractive route between the Great Lakes and the Atlantic; elastic enough to admit of prompt minor changes that may from time to time appear desirable; and so sound and well considered that in all essentials it shall suffice for many years."

Of the Champlain canal, he said that on the completion of the work then under contract there would be about twenty-eight and one-half miles of enlarged canal, the greater part of which would have a uniform depth of six feet, forty-four feet bottom width

and fifty-eight feet water-surface. The towing-path bank would have a top width of fourteen feet and a height of two feet above the water-surface at the inner angle. As the amounts already expended would be comparatively thrown away unless the whole enlargement was completed, he recommended that the entire canal should be so enlarged as to have a uniform depth of seven feet. Continuing, he said: "The plan of enlargement should include the straightening of the line of the present canal; sharp curves now exist which render navigation very difficult where a direct line over a nearly level surface, and no more expensive, could have been adopted.

"From the information at hand, it appears that the enlargement of the canal can generally be done by excavating the bottom from the junction at West Troy to the Saratoga bridge at Northumberland, and by raising the banks, from the Saratoga bridge to Whitehall." It was estimated that the increased tonnage of one boat would amount to about fifty tons for each foot deepened, providing no change was made to existing boats or structures.

In accordance with these suggestions the Legislature on March 6, 1895, passed an act (chapter 79) "making provision for issuing bonds to the amount of not to exceed nine millions of dollars for the improvement of the Erie, Champlain and Oswego canals, and providing for a submission of the same to the people to be voted upon at the general election to be held in the year eighteen hundred and ninety-five." On November 5 of that year the people of the State ratified this law by a majority of 276,886, thereby showing their desire to have the canal system improved. The act provided for deepening the Champlain canal to seven feet of water.

As the many events which led to the adoption of this plan of enlargement have been fully treated in their relation to the Erie canal, and as the same causes were usually operating in common to bring about the improvement of the Erie, Champlain and Oswego canals, it is unnecessary to repeat the general discussion here. For the same reason little is said in this chapter in regard to the stoppage of this improvement and the subsequent inception and adoption of the next great enlargement—the Barge canal.

The Superintendent of Public Works in his report for 1896 says: "My judgment in relation to this matter is, that the appropriation of nine millions of dollars just made for the canals, is in

no direct sense to be considered as an appropriation for enlargement; that it is intended to be used in improving or, in other words, putting in as perfect condition as possible the canals, they retaining their present dimensions except as relates to depth of water. It involves the rebuilding of mechanical structures now in an unsafe condition, the rebuilding of vertical and slope walls where necessary, the raising and strengthening of embankments, together with all work which those previously mentioned involves; also to lower the bottom of the prism at least one foot and also to remove the vast amount of silt therein which is the accumulation of a quarter of a century of neglect. Two results are expected from the proposed form of improvement. First.—That the canals shall be restored to their original integrity so far as strength, durability and repair are concerned; and, second, that such conditions of strength and protection of banks and depth of water will be secured as will render safe and invite arrangements for an increase in the speed of boats, and under the terms of the act, the strengthening and protection of banks and increased depth of water, may be supplemented by certain improvements of the locks which will also decrease the time now required in the passage of boats.

“It therefore seems that the central idea of the improvement is not directly one of enlargement, but such a plan of improvement as will render possible a large increase in the number of trips made by each boat during the season of navigation and which will thus incidentally result in a practical enlargement.”²⁰

The first work done under this new law consisted in making careful surveys of the entire work. These surveys were followed by the awarding of contracts for about sixteen miles of the Champlain canal. In January, 1898, it appeared that \$9,000,000 would be inadequate to fully accomplish the enlargement as originally contemplated. The Constitutional Convention of 1894, the first body to deal with the question of this improvement, called upon the State Engineer and the Superintendent of Public Works to prepare estimates. These estimates of \$11,573,000 and \$9,456,000, respectively, were made in twelve days, and, as no surveys had yet been made, they could not be based on any reli-

²⁰*Report of Superintendent of Public Works, 1895, p. 21.*

able data, but were merely "as close approximations as it was possible to make from a mere knowledge of the length of the work and without knowledge, except of the most general kind, as to the condition of the walls and structures."

It seems that the sum of \$9,000,000 was inserted in the bill at the instigation of the various commercial bodies of the state, as a sum more likely to be acceptable to the taxpayers than the larger sum indicated by the State Engineer. The important question of what that amount would accomplish seems to have been disregarded. This canal, like the Erie and Oswego, needed larger expenditures than the appropriation provided for. As the work progressed it was found that much of the old slope and vertical wall, which it was hoped could be saved, was in such poor condition as to require rebuilding. On the Champlain canal several special difficulties presented themselves, which increased the cost many thousand dollars. These were chiefly breaks in the towing-path, the banks slipping into the canal for long distances. At the time when the fund of \$9,000,000 was exhausted, contracts for improving 29.87 miles of the Champlain canal had been let, of which 5.88 miles were completed. It was estimated that it would require a further appropriation of \$1,824,000 to complete the improvement of this canal.

Between the stoppage of this work and the beginning of the Barge canal there is little to record that has not been mentioned in the preceding chapter. When the preliminary surveys for the Barge canal were in progress in 1900, the estimates for the Champlain route were prepared from the notes of former surveys. By the referendum of 1903 (chapter 147) this canal was authorized as a part of the Barge project, with the following route: "Beginning in the Hudson river at Waterford, thence up the Hudson river canalized to near Fort Edward; thence via the present route of the Champlain canal to Lake Champlain near Whitehall." The size of canal prism is the same for the Erie, Champlain and Oswego canals, the minimum dimensions being prescribed as follows: bottom width, seventy-five feet; depth, twelve feet; cross-section of water, eleven hundred and twenty-eight square feet, except at aqueducts and through cities and villages where the width and cross-section of water may be modified as deemed necessary by the State Engineer and approved by the Canal Board.

The minimum dimensions in rivers are: bottom width, two hundred feet; depth, twelve feet; cross-section of water, twenty-four hundred square feet. The law as amended in 1905 says that "the locks shall have the following governing dimensions: Minimum length between hollow quoins, three hundred and twenty-eight feet, minimum width twenty-eight feet, minimum depth in lock chamber and on mitre sills, eleven feet."

As related in the preceding chapter, this amendment did not definitely fix the size of locks, but placed upon the canal board the duty of determining the exact dimensions. According to the decision of that body the length is to be three hundred and twenty-eight feet, the width, forty-five feet and the depth of water, twelve feet over the miter-sills.

Pursuant to the laws, this canal is now in process of construction. The first work was done on April 24, 1905, at Fort Miller, this being the first work on any portion of the Barge canal.

CHAPTER VII.

THE OSWEGO CANAL.

From the abandonment of the "Ontario route" to the present time.

As we have seen in the story of the first attempts at the improvement of inland navigation, a natural line of water communication between the Great Lakes and the Hudson river could be completed by connecting the Mohawk river and Wood creek at Rome. By this route there would be five portages,—Cohoes, Little falls, Rome, Oswego falls and Niagara falls. This route utilized the Hudson river from New York City to Waterford, the Mohawk river from Waterford to Rome, Wood creek from Rome to Oneida lake, the Oneida river to Three River Point, the Oswego river to Lake Ontario, and Lake Ontario and the Niagara river to Lake Erie. By constructing canals and locks around these five portages an uninterrupted water communication could be secured from New York City to the Great Lakes.

It will be remembered that, on March 30, 1792, a company, called the Western Inland Lock Navigation Company, was incorporated for the purpose of opening a lock navigation between the Hudson river and Lake Ontario. This company built a canal around the falls of Little Falls, connected the Mohawk river with Wood creek at Rome, and improved the navigation of Wood creek; but on the 11th of April, 1808, the company surrendered all of its grant west of Oneida lake.

During the early consideration of the plans for the Grand, or what was afterwards known as the Erie canal, opinion was quite evenly divided as to whether the natural route, which was originally called the Ontario route, or an artificial inland navigation through the centre of the state from Rome to Lake Erie, should be adopted.

The circumstances which induced the Legislature to order surveys for a canal are told in the story of the Erie canal and need not be repeated here. On June 11, 1808, James Geddes was

appointed to make a careful examination of the proposed routes, and so firmly was the idea of the Ontario route established in the public mind that his instructions from the Surveyor-General were to devote his chief endeavors toward investigating that route. He surveyed two routes from Oneida lake to Lake Ontario, one directly across by way of Salmon creek, and the other by following the valleys of the Oneida and Oswego rivers (formerly Onondaga river). The first route was investigated because of a recommendation which William Weston, the English engineer, had made to the Directors of the Western and Northern Inland Lock Navigation Companies, in the following words: "From hence [Oswego falls] to Oswego, where the Onondaga river dis-embogues itself into Ontario, is a continued rapid for twelve miles. The adjacent shores being very steep and rocky, preclude every idea of conducting a canal along the bank; as the only remedy, recourse must be had to dams and locks.—Averse as I am to this mode, yet necessity compels us (however reluctantly) to adopt it.

" . . . but previous to this, or the expenditure of any money, below three river point, it will be adviseable to examine, attentively, every other line of communication with lake Ontario. that has the least appearance of practicability. For this purpose, I shall suggest to the board, the propriety of exploring the intermediate country, between Rotterdam [Constantia] and Salmon creek."¹

In regard to his surveys, Mr. Geddes reported: "Ever since the 'cutting a canal on the adjacent shore' of the Oswego river has been pronounced 'absolutely impracticable,' hopes have been entertained of finding a route from Oneida lake to lake Ontario, so favourable, that although 'the distance is 22 miles, it was expected that the line of the canal would not exceed 26 miles.'"

"Between Rotterdam on lake Oneida, and Salmon Creek on lake Ontario, I find the summit of 110 feet above the level of Oneida lake . . . Now, admitting there was water sufficient to supply the summit between Oneida and Ontario, yet 220

¹*Report of Mr. Weston to the Directors of the Western and Northern Inland Lock Navigation Companies, December 23, 1795, pp. 17-18.*

*Mr. Gallatin's report, page 44. (Foot-note appearing in *Mr. Geddes' report.*)

feet of extra lockage, added to 124 feet which Oneida lies above Ontario, makes 344 feet of lockage, an objection to the route which will most probably be considered insuperable.”²

Of the route following the Oneida river and the valley of the Oswego river, he reported that from Oneida lake to Three River Point the distance was estimated at eighteen miles, with a fall of twelve and one-half feet, and from Three River Point to Oswego the distance was estimated at twenty-four miles, with one hundred and eleven and one-half feet fall.

From the Oswego falls to Oswego on Lake Ontario he considered that there must be a side-cut the whole way, the only practicable route being on the west side of the river. Of the water-supply for this side-cut, he says:

“The lockage water would have to be taken from the river and drawn through the whole length of the canal. The Fish lake is a handsome natural reservoir of more than 500 acres, and 21 feet above the level of the top of the falls. But the feeder would have to be near 2 miles long, and must enter the canal not more than that distance from its head. A little water at all times is afforded by the Cranberry-marsh, and a few small springs along the line, which is all that can be got with any reasonable expense.”³

When the route of the Erie canal was finally decided upon, the commissioners adopted the inland route, for the reason that by this route more of the western trade would be diverted from Canada than by the Ontario route.

In the spring of 1808, Albert Gallatin, then Secretary of the Treasury, presented to Congress a valuable report on the internal navigation of the country. This report resulted from President Jefferson's suggestion, in his second inaugural address, that the surplus monies in the treasury should be appropriated to the great National objects of opening canals and making turnpike roads. One of the canals that Mr. Gallatin proposed was the connection of the Hudson river with Lake Erie by the Ontario route. However, nothing ever resulted directly from this great plan.

²*Laws of the State of New York in relation to the Erie and Champlain Canals, etc.*, p. 13. (Albany, 1825.)

³*Id.* p. 18.

The Erie canal, as finally constructed, passed through Syracuse south of Onondaga lake, but both during and after its construction the agitation continued for the connection of the waters of the Erie canal and Lake Ontario at Oswego.

In the spring of 1819, upon the recommendation of the canal commissioners, a law was enacted authorizing the opening of a navigable side-cut from the Erie canal to the salt works at Salina and appropriating \$6,000 for that purpose. This side-cut, one mile and forty-three chains long, was completed during that year. This was the first step towards the Oswego canal.

During the session of 1819, several petitions were presented to the Legislature praying for the improvement of the Oswego river so as to connect the waters of Lake Ontario with those of the great western canals. The committee to which these petitions were referred reported that "the improvement of the Oswego river, and the other navigable communications between Lake Ontario and the navigable waters leading to the Atlantic ocean, has, from an early period, been received by the state as an object well worthy the public attention, and must now, undoubtedly, be considered as an important link in the great chain of internal navigation, which is now prosecuting under the most happy auspices, and promising the most beneficial results to the commercial and agricultural interests of the country."⁴

On the thirteenth of April, the two Houses directed, "That the canal commissioners . . . cause a survey of the Oswego river, and such other points of communication as they may think expedient, between Lake Ontario and the great western canal, to be made, with a view of ascertaining the improvements of which they are susceptible, so as to render them capable of navigation; and that they report the same, and an estimate of the expenses of such improvement, together with their opinion in the premises, to the Legislature, at their next session."⁵

In pursuance of this resolution the canal commissioners caused plans of such improvements to be made and estimates of their expense to be formed. They reported the improvements to be undoubtedly practicable.

⁴*Assembly Journal*, 1819, p. 632.

⁵*Senate Journal*, 1819, p. 329.

Estimates were presented on two methods of construction. One plan provided for slack-water navigation from Oswego to the Oswego falls, with a canal around the falls, the estimated cost being \$299,519.41, while the other method provided for making all the locks inland, and a canal in the bank of the river. The estimate for this plan amounted to \$212,599. The plans provided for improvements to within about eighty rods of sloop and schooner navigation in the harbor of Oswego. To improve the navigation of the outlet of Onondaga lake, Mr. David S. Bates, the engineer, proposed the lowering of the lake to the level of Seneca river. He said: "This may be done by a canal cut in a straight direction between the lake and river, of such depth as to hold four feet water; this would give an average cutting, of six feet and fifty hundredths, and the length would be about fifty-three or fifty-four chains."^a

Under the first plan, that for canalizing the Oswego river, the canal around the falls was calculated for either side of the river; under the second plan, for the eastern side of the river. If the river navigation should require a towing-path on the bank, the additional expense would be about \$1,000 per mile, or \$12,000 in the aggregate. The distance between Salina and Oswego by water was estimated at thirty-six miles and the fall, one hundred and fifty-six feet.

At this time New York State owned an extensive tract of land in Onondaga county, which had been set apart for the use of salt springs. On March 30, 1820, a law was passed directing the commissioners of the land office to have this tract surveyed into lots and to sell the same, reserving for the State all salt springs and mines upon such lands. The money arising from such sales was to be turned over to the canal fund to be used for the improvement of the navigation of the Oswego river, and of the communication between the branch canal at Salina and Onondaga lake.

On April 17, 1822, an act (chapter 274) was passed authorizing the canal commissioners to extend the Salina side-cut to the navigable waters of Onondaga lake. At this same session of the Legislature the commissioners were directed to lower Onondaga lake to the level of the Seneca river by making a cut of sufficient

^a*Assembly Journal*, 1820, p. 501.

width and depth to permit the waters of the lake to subside with the fall of the Seneca river and to afford a good boat navigation between the lake and river. For this purpose the commissioners were allowed to spend \$4,500 of the money arising from the sale of the Onondaga salt-tract.

On the completion of the work authorized under these two enactments, the passage from the Erie canal to the Seneca river by way of Onondaga lake was as near perfect as was required at that time.

On April 23, 1823, the Oswego Canal Company was incorporated (chapter 241) with a capital of \$10,000. The act of incorporation gave the directors of the company the power to build a canal on a route designated by, and under plans approved by, an engineer to be appointed by the canal commissioners, and to utilize a portion of the waters of the Oswego river, and to conduct these waters out of the Oswego river at a point above the Oswego rapids upon the east side of the river to such point as the company might require. It gave them the power to sell or let for a limited time, for mills and other hydraulic purposes, the water that would be conveyed in the canal. The act provided for the adoption of this canal as a part of the contemplated improvement between Lake Ontario and the Erie canal, if at any time such a course became expedient, saying, "the canal commissioners shall at all times have full power, in behalf of the state, to enter upon and make all necessary alterations that by them shall be deemed advisable, to take and make use of the waters therefrom, for the use and purposes of filling and supplying all locks that may be constructed to connect the said canal with Lake Ontario; and the said canal shall thereafter become the property of this state, without any payment or compensation whatever to said company: *Provided, however* . . . that they shall be permitted to take, make use of, and enjoy the surplus waters of said canal, not necessary for filling or supplying the locks that may be erected by the said canal commissioners."

The time for completing the canal was limited to December 1, 1825. Soon after being incorporated the company began operations, but before much could be accomplished, the State assumed

¹*Laws of 1823*, p. 322.

control of the work, as will be seen a little farther along in this chapter.

As the result of several petitions signed by a large number of people residing on the Seneca and Oswego rivers and in the neighboring country, the canal commissioners were authorized to have a "scientific examination" made of the Oswego river from the head of the falls to Lake Ontario, and \$100 was appropriated for this object. This act was passed on the same day as the law incorporating the Oswego Canal Company. Mr. Holmes Hutchinson, the engineer employed to make this survey, reported in the following year that he estimated the cost of the canal at \$227,568.33. By this survey and estimate it was calculated that the \$25,000 appropriated in 1820 would be sufficient to construct all the works wanted between Onondaga lake and the head of the Oswego falls, except such as might be useful in overcoming the small impediment presented by Gaston's rift; and that \$28,000 more would be sufficient for the construction of such improvements from the head to the foot of the Oswego falls, as would admit of the passage of boats through that part of the communication. If these last improvements were made there would be a boat navigation all the way from the Erie canal to Lake Ontario, subject to the inconvenience, during low water, of lightening heavy loads below the Oswego falls. As a result of this estimate \$28,000 was appropriated in November, 1824, (chapter 279) for the above mentioned purpose, with the understanding that the remainder of the \$227,568.33 should be appropriated as soon as the condition of the canal fund would justify the expenditure.

There were many reasons advanced in favor of the contemplated improvements. The State owned over seven thousand acres of land in the vicinity, the value of which would be greatly increased; this was the shortest and cheapest route by which the Erie canal could be connected with Lake Ontario; the cost of manufacturing salt would be greatly cheapened, as the proposed improvements would open very extensive timber tracts, and the salt works then demanded thirty thousand cords of wood per year; more salt would then be manufactured and the State would derive a larger revenue; a navigable connection would be made between the Erie canal and over five hundred miles of coast,

tolerably well settled along Lake Ontario and the St. Lawrence river, and in addition Jefferson and St. Lawrence counties would again gain access to markets which they had been shut off from by the unfriendly regulations of the Canadian Government.

With the exception of some of the inhabitants of Monroe county, every section of the state was heartily in favor of this proposed canal. The people of Rochester, who wished to have the connection between the Erie canal and Lake Ontario made in the Genesee valley, declared that the Oswego route would "for many years to come greatly diminish the revenue of the State." As a result of various petitions, the joint committee on canals and internal improvements on March 5, 1825, thus reported: "The subject has been repeatedly investigated, for years past, by successive legislatures; its importance and necessity never denied; and a determination always evinced to carry it into execution, whenever a due regard to the interests of the state would permit. In the opinion of the committee, the time has emphatically arrived when this great improvement should be no longer delayed."³

They introduced a bill appropriating \$160,000 for this object, which became a law on April 20, 1825 (chapter 272).

Contracts were let very soon after this bill was passed and by the close of the year 1826 the canal was completed from the outlet of Onondaga lake to the Three River rift, a distance of about ten miles. Gaston's rift, a rapid of half a mile in length, which consisted of rock, was cut through to such a depth as to reduce the water above it to the level below, and to form one continuous level from the outlet of the lake. This section was opened to navigation in the spring of 1827. Throughout the entire length of this canal the river was utilized in all places where it afforded a sufficient depth of water and was not obstructed by rapids. The tow-path was built on the bank, or in a few instances in the middle of the stream so as to be near deep water. Where the river was obstructed by rapids the canal was built independently of the river and the descent was overcome by locks. For several miles between Oswego falls and Oswego, where the high lands approached the bank, the canal was constructed in the border of the river, and a sloping wall of cobblestone was raised on the outside of the canal to protect the embankment.

³*Assembly Journal*, 1825, p. 687.

The locks were modeled after those on the Erie and were made of cut stone.

The Oswego river was particularly well adapted for slack-water navigation, as it did not receive its waters from unreliable mountain streams but was fed by a large number of lakes, that through the summer gradually discharged the waters which had accumulated during the previous winter.

In the spring of 1827 over half of the work from the falls to Oswego harbor was performed and all of the contracts were progressing rapidly.

The law ordering the construction of the Oswego canal did not authorize its connection with the Erie canal at Salina, and in 1827 the canal commissioners reported to the Legislature that the intervening lake navigation would always be inconvenient and at times dangerous for canal boats; the water of the lake broke with too great violence upon the shore to admit of the construction of a towing-path upon it, and without this accommodation, or a canal along its borders and beyond the reach of the surf, boats would be dependent upon the winds and the weather for a passage from one canal to the other. They reported further that the northern shore of the lake presented "ground remarkably favorable for the construction of a canal, five or six miles long, which would form the desired connection." To carry out these plans they accordingly advised an appropriation of \$210,000, which was made on April 12, 1827 (chapter 219).

It was expected that the Oswego canal would be entirely finished by the time of opening navigation in 1828, but in the middle of the summer a severe epidemic of malignant fever broke out at several places on the work and continued until late in the fall, before and after which period the weather was wet and stormy and added greatly to the difficulty of executing the work. This illness not only lessened the number of effective laborers but also raised the price of labor beyond the ability of many of the contractors to pay, and several of them were discouraged and gave up their contracts. The contractor who was to build the locks was himself taken ill and died in October, an effort being made to complete the work after his death, but without success. Work was greatly delayed in the following summer by this same malady and by frequent and continued rains, but on the return

of cool weather in autumn the illness abated and the work was completed in December, 1828.

As completed the Oswego canal was about thirty-eight miles in length. Of this distance, 19.7 miles consisted of independent canals connected with the Oswego river by locks and dams. The other 18.56 miles was a slack-water navigation in the river, accommodated with a convenient towing-path along its bank. Its structures of timber and stone consisted of twenty-two towing-path and other bridges, seven culverts, one aqueduct, two waste-weirs and eight dams built across the river, thirteen locks of stone masonry and one of stone and timber, having an aggregate lift of one hundred and twenty-three feet, which was the difference of elevation between the marsh lands at the village of Salina and the surface of the water on Lake Ontario.* In January, 1829, \$505,115.37 had been paid for the construction of this canal, and it was estimated that \$20,000 further would be required to settle all claims against the canal board.

On April 28, 1829, the Oswego canal was opened to navigation throughout its whole extent. The canal bank along the shore of Onondaga lake was composed of so loose a soil, and was so much abraded by the water of the lake on the one side and of the canal on the other, that it was found necessary to secure it on both sides with a facing of timber.

The Oswego Canal Company, soon after its incorporation in 1823, commenced the projected work. After the company had expended from \$3,000 to \$4,000 on improvements, the law was passed authorizing the construction of the Oswego canal. Thereupon the canal commissioners assumed control of the work that had already been done and let contracts for the completion of the work in accordance with plans for the Oswego canal. The Oswego Canal Company being the lowest bidders on section No. 13, which embraced all that portion of the company's work which was included in the location of the Oswego canal, received the contract. The work partially completed by the company was changed and enlarged so as to conform to other portions of the canal, and the company, as contractor, was paid by the State the sum of \$15,300 for finishing the work. When completed, this section was owned in common by the State and the canal

* This does not include the locks and lockage between Salina and Syracuse.

company, and was paid for by both State and company; the one having a right to an uninterrupted navigation and the use of the tow-path, and the other having a right, according to its charter, to the surplus water for hydraulic purposes.

Almost the only repairs required on this canal during the next few years consisted in raising the tow-path along the Seneca and Oswego rivers where the water would overflow it in the spring.

For the season of 1830 the tolls on the Oswego canal amounted to only \$12,335.18, but a large proportion of the wood which was used in the manufacture of salt was brought upon this canal free of charge. Had the usual charges been made on this article it would have added about \$3,000 to the collections.

In 1836 the acting canal commissioners were authorized (chapter 79) to rebuild the lock known as Mud lock of such size and dimensions as in their judgment the public interest and convenience required. This lock was originally built of wood, but under this act it was rebuilt of stone, and it was moved a little east of the former lock. This alteration in the line improved the navigation by rendering the access to and from the river more safe and easy, and by avoiding a bar that was forming at the foot of the old lock.

In 1839, when the enlargement of the Erie canal was in progress, a strong feeling was aroused among the inhabitants of Oneida county and of Syracuse towards extending these improvements so as to cover the Oswego canal. The State annually derived a large revenue from the manufacture of salt on the public lands in Onondaga county, and one of the principal arguments advanced in favor of the enlargement was the fact that the proposed improvements would cheapen the cost of fuel, practically all of which came by way of the Oswego canal, and thereby would diminish the expense of manufacturing the salt. Furthermore, the cost of transportation would be materially lessened, so that the output would be increased, and it would be carried to markets which were at that time supplied from other sources.

As originally constructed this canal was forty feet wide at the water-surface and four feet deep, while the locks were ninety feet long by fifteen feet wide, and the guard-locks were ninety feet long by seventeen feet wide. As a result of several petitions

of the inhabitants of the locality interested, the canal board reported that the enlargement of the Oswego canal would undoubtedly be to the material advantage of the State and that by already having constructed one lock on the Oswego canal of a size adapted to the contemplated enlargement, the Legislature had to some extent indicated the policy of the State in regard to this canal. They reported, however, that in consideration of the great amount of canal work going on at that time, of the consequent vast expenditures thereby demanded, and of the scarcity of engineers and laborers for undertaking new work and the resulting high price of labor, the immediate enlargement was impracticable, but that the policy of the State in regard to its future enlargement should be known, so as to guide the commissioners in making repairs in such a way that future enlargement would not render them useless. They also recommended that surveys and examinations be made to ascertain the best means and the probable expense of enlarging the Oswego canal.

For several years practically no work had been required on the Oswego canal to keep it in repair, beyond removing a few troublesome bars in the Liverpool and Phoenix levels. In 1842 it was found necessary to make some rather extensive repairs in the neighborhood of Liverpool. A short distance north of this town there was a low marsh and swamp on the east side of the canal. At this point the berme bank of the canal was entirely washed away, permitting the water from the canal to cover a considerable tract of these low grounds to an elevation corresponding with that of the water in the canal. This circumstance was thought to be the cause of a severe epidemic of illness with which the people in the vicinity were afflicted, and it was found necessary to raise an embankment on the east side of the canal of sufficient solidity and elevation to retain the water, and also to construct a ditch on the outer side, extending to a culvert about a mile from the head of the swamp, of sufficient size to carry off the waters from the marsh, which had been obstructed in their natural course to Onondaga lake by the construction of the canal.

As previously told, some time before the Oswego canal was constructed, an artificial outlet was cut in a direct line from the north end of Onondaga lake to the Seneca river, a distance of

about thirty-three hundred feet. This channel was about five feet deep and was designed to lower the lake and prevent inundations in the vicinity of the salt springs at Salina and Liverpool, and also for the purpose of navigation, previous to the construction of the Liverpool level of the Oswego canal. On the completion of that level this cut was abandoned as a navigable channel, but as no pier nor breakwater had been raised in the lake to protect the entrance of the new channel, marl and other light substances, driven in by southerly winds, had so far obstructed the flow of water that the surface of the lake had nearly attained its former elevation.

By the fourth section of an act entitled, "An act in relation to the Onondaga and Montezuma salt springs," passed May 10, 1841, the canal commissioners were authorized to cause this outlet to be excavated, so as to reduce the level of the lake, as nearly as practicable, to that of the Seneca river, and it was also provided that the expense of the work, not exceeding \$1,000, should be paid by the superintendent of the salt springs, upon the order of the acting commissioner on that section of the canals. By 1842 this channel had been reopened to the depth of about five feet and the lake had receded very nearly to the level of the Seneca river. The total cost of the work amounted to \$949.04. By the fifth section of this same act the commissioners were "also authorized to take the waters of the Onondaga creek below the sawmill of the late Henry Seymour, in the village of Salina, into the Liverpool level of the Oswego canal, for the purpose of furnishing sufficient surplus water to propel the public pumps at Liverpool." This work was executed in a substantial manner and at a moderate expense, whereby an ample supply of water for propelling the public pumps, and at the same time maintaining the navigation on that level of the canal, was obtained.

By the "Stop law" (chapter 114), passed in 1842, all work on the canals was stopped except such as was absolutely necessary for the preservation of work already completed or in process of construction. This law did not materially affect the Oswego canal, as but little work had been in progress for several years.

In 1845 numerous citizens of western New York petitioned for a discrimination of tolls in favor of the western section of the Erie

canal, claiming that the agricultural products of the upper or western lakes were being introduced to the markets of New York State through the Welland canal, Lake Ontario and the Oswego canal, cheaper than by the route available to the inhabitants of western New York. Besides, by this route, boats passing from Buffalo to Albany would avoid traversing and paying toll on one hundred and fifty-five miles of New York State canals. To overcome this it was proposed to make the tolls on the Oswego high enough to equalize this advantage over the other route. This, however, appeared to the State Legislators to be a very narrow policy, as was forcibly expressed in the language of the State paper of Columbus, Ohio, addressed to the movers of this project: "You may drive this trade from you—you may force one part through the Pennsylvania improvements—you may force another part through the Canadian improvements to Montreal—a third down the Ohio to New-Orleans—and anon, another across the Alleghanies by the Baltimore & Ohio railroad, but you cannot force it against its interest through your one hundred and fifty-five miles of canal." Accordingly this project was given up.

In 1845 (chapter 128) the canal commissioners were authorized to take charge of the side-cut canals in the village of Liverpool connected with the Oswego canal and to keep them in repair as a part of that canal. In this year it was discovered that the dams in the Oswego river had been weakened considerably by the operations of a species of insect very prevalent in the bed of the river. These insects perforated the timber of which the dams were composed and did a great deal of damage, which necessitated large expenditures for repairs. The rebuilding of the road and towing-path bridge at Three River Point and of the aqueduct at Waterhouse creek was begun in 1845, but the season proved so unfavorable that the work was abandoned and was not fully completed until 1847.

The demand for hydraulic power on the Oswego river increased very rapidly and while it was desirable to permit its use at as many of the dams as was practicable without improperly encumbering the canal or affecting the water required for purposes of navigation, it was found that during the extreme low stages of

**Assembly Documents, 1845, No. 189, p. 5.*

the river, which usually occurred in the latter part of August or September, the large quantity of water drawn for milling and other purposes, together with that used by the canal and lost by leakage at the dams, frequently reduced the supply below that required for good navigation. As a remedy for this it was required that weirs be built in front of all the flumes, through which water passed to the machinery, located at the various dams on the Oswego river, to prevent the water from being so drawn as improperly to depress the surface of the canal.

After the adoption of the new State Constitution in 1846 the Oswego canal began a new era in its history. This Constitution permitted appropriations for the canals under certain restrictions. In the year 1847 (chapter 262) \$100,000 was appropriated towards the improvement and enlargement of the locks upon the Oswego canal. The canal commissioners were, however, placed under heavy restrictions in the use of this money. Whenever it should be found necessary to rebuild a lock the commissioners were directed to enlarge it so as to correspond in length and width with the enlarged locks on the Erie canal, but this fund of \$100,000 should only be used to defray the difference in expense of constructing the enlarged lock and the cost of reproducing the original lock. The balance of the cost was to be paid from the ordinary repair fund. Further conditions were thus stated: "But in no event shall all such locks be enlarged until one tier of enlarged locks on the Erie canal shall be completed from Syracuse to Buffalo, nor shall any of the locks upon the Oswego canal be re-built, until such re-building shall be rendered necessary by the failure of those now in use."

The commissioners proceeded to have plans and estimates for the rebuilding of the locks made and also considered suggestions relative to alterations in the line of the existing canal. It was thought that it would be for the best interest of the State to make changes in the location and lift of some of the locks and in the line of the canal. The result of this investigation was the adoption of a plan for the portion at Fulton, which, when fully completed, would dispense with one dam and two guard-locks, and for the portion at Oswego, which would dispense with one dam and two change-bridges, and would make an entire separation of the canal from the river at Fulton by constructing an inde-

pendent canal through the pond, and at Oswego by an independent canal from the "High dam" down, crossing the Oswego Company's mill-race and the existing canal by an aqueduct. Contracts were let as soon as possible and work was progressing rapidly when, by a legislative enactment (chapter 371, Laws of 1850), those portions of the law of 1847 which gave the commissioners power to change the location of the locks were repealed. Under this new law the canal commissioners were directed to discontinue, without delay, all work on the Oswego canal that had been commenced or put under contract under the provisions of the repealed sections of the act of 1847. This was a heavy setback to the progress of the Oswego canal, but it seemed to be the only way of preventing a great reduction in the revenues of the State.

When it was first proposed to improve the navigation of the Oswego river, sagacious statesmen at that period foresaw that the new route would essentially diminish the revenues of the Erie canal, and provision was made to charge the same amount of tolls upon the Oswego canal as would be derived upon produce and merchandise transported upon the entire length of the canal west of Syracuse, and the work was authorized by law with this understanding; but in 1850 the same rates of toll per mile were charged upon the Oswego and the Erie canals and the result justified the prediction of the statesmen of the period referred to.

When the Constitutional Convention had under consideration the project to enlarge the Erie canal and pay the debt of the State, that body of sagacious and prudent men determined that the Oswego canal should not be enlarged until after the enlargement of the Erie canal throughout its entire length. For the purpose of understanding the effect of enlarging the Oswego canal, before the completion of the Erie canal enlargement, it is interesting to note that the tolls on eastward-bound freight in 1837 amounted to \$128,570 at Buffalo and \$31,546 at Oswego, and in 1847 they amounted to \$1,216,701 at Buffalo and \$233,296 at Oswego, while in 1850 they amounted to \$703,498.19 at Buffalo and \$310,135.39 at Oswego.

In the spring of 1851 Legislators took a different view of this subject, as a result of representations that by far the larger pro-

portion of the revenue from the Oswego canal was derived from property coming from the borders of Lake Ontario, the St. Lawrence river, and the interior of Canada, rather than through the Welland canal as had been supposed. The principal part of this trade would have been lost to the citizens of New York State had it not been for the Oswego canal. In view of the growing importance of the trade of this region and in the belief that the enlargement of the Erie canal would soon be completed, a law was passed in 1851 (chapter 501) appropriating \$200,000 to be available in 1851, and a like amount for the following year, towards the enlargement of the locks of the Oswego canal, any surplus to be used in enlarging the canal prism itself. Surveys for the location of locks were made immediately and contracts were let on December 30, 1851, to be completed April 15, 1854. The enlarged lift-locks were generally located a short distance below the old ones for the purpose of building them during the season of navigation. The guard-locks in the old locations were to be built during the suspension of navigation.

The location of the new work at Salina did not materially change the route of the old canal. The new location was made with reference to continuing the connection with the salt slips, which had become of considerable importance. The plan as adopted proposed to dispense with one lock on the canal, but to construct a connecting lock with the slips. This was thought to be better economy than to maintain the connection by reconstructing the four locks on the canal. Much difficulty would have been found in locating the four enlarged locks to accommodate the salt slips and at the same time to make a good pound-reach between them. Three locks at Fulton and one at Oswego were completed in 1851.

The Assembly committee on canals in 1853 made an interesting report of the relative importance of the Oswego and Champlain canals. They said in part: "This [Oswego] canal, although but 38 miles in length, and apparently the third canal in productiveness in the State, is in reality second only to the Erie canal in contributing to the general revenues.

"The trade of the Oswego canal amounts to about 700,000 tons; that of the Champlain canal 513,000 tons.

"The distance from the junction of the Oswego and Erie to Albany is 171 miles; from the junction of the Champlain and Erie, 9 miles. If we were to suppose all the freight passing through each of those canals to be through freight, we should have 700,000 tons of Oswego canal trade passing over 209 miles of canal, against 500,000 tons of Champlain canal trade passing over 73 miles. This is not all through freight. But the relative proportion of through freight to the whole amount transported is largely in favor of the Oswego canal.

"The number of tons shipped from other States and Canada, by Oswego in 1852, was 381,104; from the same on the Champlain canal, 107,941.

"Probably the same disparity would be preserved in the up freight. This enables us to approximate to the contribution of each canal to the general revenues. Giving credit to each for its tonnage, the tolls of the Oswego on the 207* miles would be	\$450,000
of the Champlain	126,000

showing a difference in favor of the Oswego canal, of..	<u>\$324,000</u>
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"A large portion of the trade of this [Oswego] canal is derived from Canada. This trade is rapidly increasing and there are measures now in embryo which will undoubtedly remove some of those restrictions which tend to prevent a more thorough system of exchanges with our Canadian neighbors . . .

"The growing importance of the trade of this canal, its present productiveness as a source of revenue, and the belief that the expense of an increase of its capacity will be amply remunerated, lead the committee to recommend the application of this money so as to admit boats of 150 tons burthen."¹⁰

In 1853, under chapter 620, \$50,000 was appropriated towards enlarging the section work on the Oswego canal, and a little later in the same year \$150,000 was set apart to supply the deficiency for rebuilding the locks on this canal during the year commencing October 1, 1852, and \$100,000 for the year beginning October 1, 1853. In 1854 (chapter 16) \$10,000 was appropriated to bottom out the narrow and crooked portions of the Oswego canal.

*So in original.

¹⁰*Assembly Documents*, 1853, No. 64, pp. 11-12-13.

During the same year \$348,000 was allotted to this canal (chapters 329 and 330) towards its enlargement to the general dimensions of seventy feet in width at the water-surface, fifty-two and one-half feet at the bottom by seven feet in depth of water, the constitutional amendment of 1854 having provided a financial plan for speedily prosecuting this work. During this year the walls of the remaining locks under contract were completed, surveys and estimates were made and plans prepared for enlarging and completing this canal, and the larger portion of the work was put under contract. In the year 1855 all of the locks on the Oswego canal with the exception of guard-lock No. 2 had been completed and were in use. Guard-lock No. 2 had been temporarily lengthened to permit the use of the large class of boats and was under contract to be rebuilt of stone. The work of enlargement was under way on forty-seven contracts and there were only fourteen on which work had not been commenced. During the next four years heavy appropriations were made to complete the enlargement, amounting in all to \$1,325,023.58. The original estimates for this canal did not include the rebuilding of the tow-path, much of which had to be renewed.

Much of the work under contract in 1856 was of a very difficult nature. The two sections at Gascon's rapids,* having a descent of fifteen inches, had to be enclosed by a coffer-dam for three-fourths of a mile. Merely keeping the coffer-dam in repair was an item of great expense.

The improvement of navigation at "Gascon" presented many difficulties. It was feared that the effect of enlarging and deepening the channel there would lower the surface of the water above that point. This, however, could not be allowed, and still maintain seven feet of water at Mud lock at the head of the level. Nothing short of a lock and the widening of the remaining channel of the river, to compensate for shutting off the canal portion, would perfect it, and this improvement was estimated to cost \$46,152. This portion of the canal is a part of the river level between Phoenix and Mud lock. After the enlargement was completed and coffer-dams were allowed to remain and have since been strengthened with stone filling and riprap so as to form dikes between the canal and river channels. It was known that the inhabitants along the river and its tributaries were bitterly

*Called Gaston's rift in earlier reports.

opposed to the construction of this lock. The contract for enlarging the prism through Gascon's rapids was completed in 1858, and during the following winter and spring freshets, daily observations were made to ascertain the effect of this improvement upon the elevation of the river surface and to determine whether it would be necessary to lower Mud lock to the level of Phoenix. The results of these observations were deemed conclusive as to the necessity of lowering the miter-sill of Mud lock and plans and estimates were presented to the canal board for lowering the miter-sill of Mud lock one foot.

Under chapter 213, Laws of 1860, \$194,117 was appropriated toward the enlargement, one of the requirements of the law being that the bevels at the bottom of lock walls should be cut away so as to give a width of eighteen feet at the bottom. In 1862, \$35,000 was appropriated to complete the enlargement, which was accomplished during the year.

Navigation was greatly hindered at Syracuse on account of the inadequacy of facilities for weighing the boats and their cargoes. There was only one weigh-lock at Syracuse and all boats coming from the western division of the Erie canal or from the Oswego canal had to be weighed on this one lock. The rule adopted at Syracuse was to weigh two boats on the Erie canal to one on the Oswego. Very frequently boats were as numerous from Oswego as from the west and the delay arising from this source, and the consequent loss to boatmen was growing more and more serious as the tonnage of the canal increased. In order to remedy this condition of affairs, the construction of a weigh-lock at Oswego was advocated. The locks on the Oswego canal had all been constructed with a view of doubling them at some future time, so it was proposed to double the guard-lock at Oswego, using the new structure as a weigh-lock, which at the same time would become one of a second tier of locks. The subject of the Oswego weigh-lock dragged along for two or three years until 1863, when the Legislature set apart \$30,000 for its construction.

In 1864 the canal board in a report to the Assembly stated that the Erie and Oswego canals had nearly reached their maximum capacity for the transportation of property seeking tide-water. The prisms of these canals seemed capable of sustaining

the pressure of a large and steady accumulation of trade for many years, but the locks did not give proportionate facilities for transportation. By reason of the large number of boats necessarily employed upon the canal, great delays were occasioned at the locks, the time of passage and consequent cost of transportation being thereby increased. The only remedy for this appeared to lie in increasing the size of the locks.

Another argument of National importance in favor of enlarging the locks was the fact that by the construction of the Rideau, the St. Lawrence and the Welland canals, with gunboat capacity, Great Britain had opened a channel by which, in event of war with the United States, she could bring a fleet of gunboats of the most effective construction and size from Montreal to Lake Ontario within twenty-four hours. In such an event all the cities of the United States situated on the shores of the Great Lakes would lie at its mercy, and there was no means by which our Government could bring a fleet to meet it. By enlarging one of the double locks, where double locks existed, or by constructing a new lock, where single locks only were in use, of a capacity suitable to pass boats two hundred and ten feet in length and twenty-five feet in breadth, and by bottoming out these canals at all points so as to obtain a depth of seven feet of water, the canal board thought that they could overcome both of these disadvantages.

As this measure was thought to be essential for the protection and defense of the Nation at large, and not to be purely a local work, it was considered that New York State could not undertake the task alone, but that it belonged more properly to the General Government. For two years the Representatives of the State at Washington urged that the Federal Government should undertake this great work, but on account of the exhausted financial condition of the country their efforts were unavailing, and later when improvements of this character were made they were undertaken and completed by the Empire State alone.

Navigation on the Oswego canal was entirely dependent on eight dams. As constructed in 1827, these dams were all of wood and at this time they had nearly outlived their usefulness. In enlarging the canal but one of the dams had been rebuilt,—the one at Oswego. In 1856 part of the dam at Fulton gave way and the breach was repaired by constructing it of masonry.

When this dam was examined with the water off, the timber was found to be so decayed and the whole structure so weak that subsequently the entire dam was rebuilt of stone. In 1865 six of these old wooden dams remained, which, at low water, were exposed to the constant abrasion of 130,000 cubic feet of water per minute. The timber of these dams was entirely submerged only at high water, and such portions as were alternately wet and dry had necessarily been in constant process of decay for thirty-eight years.

In 1864 the canal commissioners had been authorized to rebuild the Phoenix and Horseshoe dams of masonry at a height that would give no more than seven feet of water in the levels above these dams and in the following year they were directed to rebuild all the remaining dams of stone and in such manner as to make them permanent, as soon as they gave signs of giving out.

In 1865 the Oswego canal suffered greatly as the result of a freshet. The tow-path was seriously damaged for over five miles on the northern border of Onondaga lake and the protecting wall along the lake had to be relaid throughout nearly its entire length. A breach two hundred and ten feet long occurred in the High dam and the canal bank below the dam was carried away for a distance of seven hundred and fifty feet. The Minetto, Van Buren, and Oswego falls dams were also seriously injured.

In 1866 work was in progress on the dams at Oswego falls, Braddock's rapids and Phoenix. The rebuilding of Horseshoe dam presented many difficulties, for, unlike the other dams upon the river, there was no rock foundation upon which to locate it. It was finally decided to build a berme bank extending from the rock at Horseshoe dam to the lock at Hinmansville, a distance of a little more than a mile, thereby doing away with the necessity of rebuilding Horseshoe dam. On account of the velocity of the current this was a difficult undertaking, but for the same reason the reconstruction of the dam would have presented equal difficulties, and even if built of stone, without a rock foundation its permanency could not have been assured.

The weigh-lock at Oswego was finished in the year 1866, thereby greatly facilitating navigation.

During the following year the stone dams at Oswego falls and Phoenix were completed and work was progressing on those

at Braddock's rapids and Minetto. In 1868 the dam at Braddock's rapids was completed, and an appropriation of \$50,000 (chapter 715) was made for reconstructing High dam with stone. Maps, plans and estimates were made and presented to the canal board and work was begun in the following year after a new location was decided upon.

In 1869 the berme bank in the river below Phoenix (which dispensed with Horseshoe dam) was completed. Several appropriations were made for the Oswego canal during this year by chapter 877; \$13,000 was allotted for deepening the Oswego river to compensate for encroachments made on this waterway by enlarging the canal; \$25,000 additional was set apart for raising protection banks and for otherwise improving the canal; and \$4,000 for building a vertical wall near Bradley's creek to protect the berme bank from being washed away.

A great deal of work was necessitated at Salina by the erection of salt blocks, brine vats and piles of coal too close to the edges of the slips, which were already narrow and were narrowed still more by any slight yielding of the banks. An appropriation of \$15,000 was made for building docks on the north and south side-cuts of the canal at Salina, which were rendered necessary by the deepening of the channel.

In 1870 the dam at Minetto was practically completed. Then all the original timber dams had been replaced by permanent stone structures except the Horseshoe dam, which had been dispensed with, and the High dam, the contract for which had been let. At one time this old dam was found to be so leaky that all of the water of the Oswego river went through it and none over it, thus stopping navigation temporarily. However, the contractors were hurried along and by making slight repairs navigation was resumed. In 1871 (chapter 930) \$22,000 was appropriated towards the reconstruction of the High dam and \$15,000 for raising the low banks along the river levels. In the following year \$88,000 was added to the fund for the completion of High dam. The repairs to old work on the canal were very insignificant for several years. In the spring of 1873 the greater portion of High dam had been completed, including its connections with the west shore of the river. The main part of the

old dam, together with its foundation, was left undisturbed and the space between the old and the new dams was filled with stone. During this year \$60,000 was appropriated to complete this structure and \$10,000 for building vertical walls along the berme bank.

During the great freshets of April, 1873, the Oswego canal was submerged throughout its entire length. Works that had been built under the supposition that they were high enough to escape the highest floods were swept by the waters of the Seneca and Oswego rivers, which in some places broke into the canal, and after following its course for a while broke out again, sweeping away the banks, either forming large breaches or scouring the top and sides many feet in depth. The mechanical structures suffered severely and were saved from total destruction only by timely suggestions from the engineering department and through the persistent efforts of those in charge.

In the fall of 1873 High dam was completed and brought into use. This was the last of the old wooden dams on the Oswego river, but as finally built it was a magnificent stone structure. All of the stone dams were built on a rock foundation and had aprons of timber bolted to the rock. During 1874 some retaining wall was built and the berme bank below High dam was protected.

In 1876 (chapter 425) \$35,000 was appropriated towards deepening the Oswego river in the City of Oswego and for repairing the walls of the canal basin, in order to increase the capacity of the waterway. As a thorough examination by the State Engineer's department showed that the improvements provided for by this appropriation would not accomplish the purpose sought by the proposers of the act, the work was not done.

During the next few years some of the dams were protected by building sloping aprons, but all other expenses came under the head of ordinary repairs. In the report of the Superintendent of Public Works in 1883 most of the dams on the Oswego river were reported as needing no repairs for several years. High dam required watching, as its foundations were not of the best.

In the year 1884 new bulkheads were built in most of the dams but otherwise repairs were merely normal.

In 1886 the sloping crib aprons were completed on all but the Oswego dam. These crib aprons were expensive structures but were made necessary by the wearing away of the soft rock on which the dams were founded.

The agitation for enlarging the locks of the Oswego, which started away back in the early 'sixties, did not attain its object until 1886 when by chapter 646 the Legislature appropriated \$60,000 for lengthening three locks, Nos. 5 and 6, and guard-lock No. 1, making them two hundred and twenty feet long by eighteen feet wide. In the winter of 1884-5 an experiment was made in lengthening one of the Erie locks, and during the next few years most of the Erie locks and many of those on the Oswego were lengthened. During the winter of 1886-7 the three locks just mentioned were lengthened, and these were followed by others: No. 7 and guard-lock No. 4 in 1887-8; No. 11 and guard-lock No. 3 in 1888-9; Nos. 9 and 10 in 1889-90, and Nos. 8 and 12 in 1890-1. During the "nine million" improvement, lock No. 18 was also lengthened.

In 1887 work progressed on the contracts for lengthening locks. Lock No. 1 was lengthened at the foot and as it was built on a rock foundation, little trouble was experienced. But lock No. 5 ("Mud Lock") always had given a great amount of trouble, and here quicksand was encountered. However, after the expenditure of a great deal of time and money all obstacles were overcome and the lock was completed in the spring of 1887. Lock No. 6 was lengthened at the foot. Great care was taken with the foundations of all the locks, concrete being used under foundations and all sand and cement used in this concrete being first subjected to thorough tests as to their quality.

The experience of the contractor of lock No. 4 showed the inexpediency of building the masonry of locks directly on a foundation of solid rock without an intervening timber foundation. On letting in water at lock No. 4, it was discovered that the apparently solid rock had been completely shattered by the blasting formerly done in enlarging the canal. The force of the water tore up the rock in the chamber for some fifteen feet in length, about two feet in depth and nearly the whole width of the chamber. This was repaired by constructing a timber apron, but

thereafter provisions were made that under like conditions full timber foundations and concrete should always be provided.

From 1887 to 1890 appropriations were made amounting in all to \$270,000, which was spent in carrying on the work of enlarging the locks and of dredging and deepening the Oswego canal to a uniform depth of seven feet. During the same period \$20,000 was granted by the Legislature for the purpose of rebuilding the canal wall between the Oswego canal and the Oswego river in the City of Oswego.

In his annual report to the Legislature in 1890 the State Engineer and Surveyor called attention to the fact that on nearly all the independent canal levels of the Oswego canal the bottom as well as the sides of the prism was covered to a depth of six inches or a foot, rendering it necessary to carry the water-surface higher to that extent than was originally intended in order to pass loaded boats. The harbor below lock No. 18, being on the level of Lake Ontario, was subject to the fluctuations in the water-surface of that body. It had become filled with sediment and rubbish until, at ordinary low water, loaded boats could not go outside the main channel and could only pass with difficulty in the deepest portions. This condition also reduced the clearance under bridges and the relative height of the banks, which increased the danger of collision of light boats with the bridges and of flooding the banks, both by swells from steamers and by excessive feeding. The Oswego canal was navigated quite extensively by fast pleasure yachts, passing to and from Lake Ontario, as well as by numerous excursion boats, so the danger from swells was greater, aside from the condition of the prism, than on other canals, making the improvement more imperative. The State Engineer suggested that it should be dredged so as to make the whole area available for loaded boats at extreme low water.

In 1893 the State Engineer and Surveyor in his annual report advised the Legislature that no further expenditures be made in lengthening the locks on the Oswego canal, as the traffic on this canal was comparatively light and as, owing to the swiftness of the current, it was doubtful whether the system of moving boats in fleets could be economically applied there.

It is interesting to note that in 1893 there was a measure pending before Congress appropriating \$100,000 for the purpose of making a survey for a ship canal to connect the Hudson river with the Great Lakes. The two prime reasons for undertaking this gigantic work were, first, the necessity for a channel, through which war vessels might be sent through United States territory from the Atlantic to the Great Lakes; second, that grain might be sent from Duluth to Europe without breaking bulk.

Chapter 119, Laws of 1893, appropriated \$10,000 for improving the Oswego canal, and a retaining wall was constructed at lock No. 13 at Minetto. The same chapter appropriated \$5,000 for cleaning and repairing the State ditch at Liverpool.

Chapter 572, Laws of 1894, appropriated \$30,000 for the improvement of the Oswego canal. This sum, together with that appropriated in 1893, was expended in restoring aprons to dams on the Oswego river. A stone apron was constructed at Oswego dam and a steel apron at Braddock's dam.

In his report of 1895 the State Engineer and Surveyor recommended that the Erie and Oswego canals should be deepened to nine feet "whenever and however possible without radical changes in existing structures," and that all single locks on the Oswego canal which had not already been lengthened so as to accommodate two boats at a time and which would "permit of this change without undue or unwarranted cost, should be so lengthened and be also equipped with proper hydraulic machinery, not only for drawing boats in and out of locks but also for operating lock gates."

The constitutional amendments of 1894 had prepared the way for improving the canals, and the Legislature passed an act on March 6, 1895 (chapter 79), making provision for issuing bonds to the amount of \$9,000,000 for the improvement of the Erie, Champlain and Oswego canals, making this act a referendum for the next general election.

This act authorized all the improvements recommended in the report of the State Engineer of that year. It was referred to the people on November 5, 1895, and was ratified by a majority of 276,886.

In the last chapter dealing with the history of the Erie canal there have been discussed the many circumstances which, through

a long series of years, had been leading to this improvement and also the numerous schemes and surveys, both State and National, which had preceded this work and which succeeded it, preparatory to the next great enlargement—the Barge canal—and these accounts need not be repeated here. In both the “nine million” improvement and the Barge canal project, the Erie, Champlain and Oswego canals have been so inseparably associated that the records of these undertakings are best treated in common.

The act authorizing enlargement stated that this canal should be deepened to a depth of not less than nine feet of water, except over aqueducts, miter-sills, culverts and other permanent structures, where the depth of at least eight feet should be obtained. The deepening might be done by lowering the bottom, raising the banks or by a combination of both methods. The law also provided for lengthening such of the locks as had not already been lengthened.

This appropriation of nine million dollars was not applied as an appropriation for an enlargement only, but rather as one to be used in putting these canals into as perfect condition as was possible. For many years the canals had been permitted to become gradually filled with silt and as a result the speed and consequent number of trips of a canal boat per year had been greatly decreased.

It was necessary that extensive surveys should be made before any work could be prepared for letting, so actual improvements did not begin for several months. During the year 1896 contracts were let for raising Braddock's, High, Minetto and Oswego dams; for rebuilding and lengthening lock No. 18, and several contracts for improving the canal prism.

The contracts let in 1897, under the provisions of the acts for the “nine million” improvement, included those for raising the dam at Oswego falls, for raising about three and one-half miles of tow-path, and for deepening the canal prism. The contracts for improving the Lake Ontario level in the harbor of Oswego and for improving about two and one-half miles of canal were completed in 1897, and in the following year the contracts for rebuilding lock No. 18 and for raising three and one-half miles of tow-path were completed. During 1899 the contract for raising the Oswego falls dam was completed.

On account of the insufficiency of the appropriation all of the contracts on this canal, except those just mentioned as having been completed, were suspended on May 14, 1898, and afterward settled. While the final cost of this work greatly exceeded the preliminary estimates, the work done very greatly improved the navigation of the Oswego canal, and if it could have been completed upon the plans laid out, the annual repairs would have been reduced to a minimum.

After the stoppage of work on this nine-foot improvement there is little to record that has not already been told in the account of the Erie. In 1900 this route was included in the preliminary Barge canal surveys, and estimates were made for constructing that canal by this route and through Lake Ontario, as well as by continuing westward along the Seneca river. However, when the measure came before the people in the referendum of 1903 (chapter 147) the main canal was authorized to follow the Seneca river and the Oswego branch to begin at the junction of the Oswego, Seneca and Oneida rivers and to run northward to a junction with Lake Ontario at Oswego, following the canalized Oswego river and the present Oswego canal.

Pursuant to this law the work of making this canal of the size specified by the act is now being carried forward. The cross-sections of the Barge canal are shown diagrammatically in the statistical part of this volume. The law requires that the minimum dimensions shall be: seventy-five feet, bottom width; twelve feet, depth; and eleven hundred and twenty-eight square feet, cross-section of water, except at aqueducts and through cities and villages, where the dimensions may be reduced as deemed necessary by the State Engineer and approved by the canal board. In rivers the minimum dimensions must be: two hundred feet, bottom width; twelve feet, depth; and twenty-four hundred square feet, cross-section of water. As amended by the law of 1905, the locks are to have a minimum length of three hundred and twenty-eight feet between hollow quoins, a minimum width of twenty-eight feet and a minimum depth of eleven feet in lock chamber and on miter-sills. As related in the chapter dealing with the Erie canal, three hundred and twenty-eight by forty-five by twelve feet are the dimensions which have been adopted.

CHAPTER VIII.

THE CAYUGA AND SENECA CANAL.

From the inception and construction of a part of the canal by the Seneca Lock Navigation Company to the present time, including the purchase, completion and subsequent operation by the State.

This canal practically had its inception in 1813, when several enterprising and active citizens, residing in Seneca county, became solicitous for the incorporation of the "Seneca Lock Navigation Company," the aim of which was to establish a communication by water between Cayuga and Seneca lakes. This, it was thought, would give great impetus to the commercial and agricultural interests of the counties of Tioga, Steuben, Ontario and Seneca. The principal articles of the trade, which would thus be carried on, would consist of flour, salt, plaster of Paris and all kinds of grain; and the promoters considered that such a waterway would be conducive to great results, beneficial not only to those interested in the shipment of the commodities from points on the proposed water route, but to the whole internal commerce of the State. Accordingly, a petition was presented to the Legislature for such incorporation, and that body responded by the enactment of chapter 144, incorporating the company with a capital stock of \$50,000.

It will be recalled from the account of the Western Inland Lock Navigation Company that the charter of that company gave the privilege of improving navigation from the Hudson to Seneca lake. Through lack of funds the company never did any work beyond Oneida lake, and in 1808 surrendered all its grants west of that lake.

The directors of the "Seneca Lock Navigation Company" were also the directors of the "Seneca and Susquehanna Lock Navigation Company" which was incorporated in 1815 to build a canal from Seneca lake to the Chemung river, as related in the chapter dealing with the Chemung canal, but this latter company failed

to undertake any work of construction, presumably because the energies of the directors were fully engaged with the improvements upon the Seneca river route.

In passing the act of incorporation in 1813, the Legislature provided that the locks and canals constructed under the act should "be not less than twelve feet broad at the bottom or base, nor any lock less than seventy feet long between the gates," and allowed the company five years in which to complete the work. One clause of the act reads: "Whenever one thousand shares shall have been subscribed to the corporation, it shall be lawful for the comptroller of this state, and he is hereby required to subscribe on behalf of this state, five hundred shares."¹

In 1814, by act (chapter 122) the capital stock was increased to \$60,000 and in 1817 a further call of twenty-five per cent upon the original stock was authorized by an act (chapter 93), it being represented by the company, in a petition to the Legislature, that the stock subscribed in behalf of the State and by individuals had been expended and that more money was required to complete the works, the necessity arising from the superior manner in which the locks were being built. The time fixed for completing all work was extended to December 1, 1819, but in this year the officials, again having been retarded in the progress of construction by a shortage of funds, asked relief of the Legislature, which was granted by an act (chapter 93) directing the Comptroller to subscribe an additional amount of stock in order to enable the company to discharge all debts and also to complete the whole of the navigation by 1821.

In the latter year the company finished its task, having expended about \$70,000, of which the State had contributed \$21,000. The first loaded boat passed the newly constructed locks at Seneca Falls on June 14, 1818. The improved waterway allowed the passage of boats through natural streams and later through the Erie canal to the Hudson and tide-water, but the improvements were somewhat crude, consisting chiefly of locks around the falls, and no tow-path had been provided along the river. Desiring to possess the additional advantages that would attend a well-built canal, the inhabitants of the counties of Ontario, Seneca, Wayne, Yates, Steuben, Tioga, Tomp-

¹*Laws of 1813*, chapter 144, p. 223.

kins, Cayuga and Onondaga, forwarded a petition to the Legislature in 1824, asking for surveys for the purpose of making further improvements in the navigation from Cayuga and Seneca lakes to the Erie canal at Montezuma. In support of their request they stated that these lakes were nearly forty miles in length, stretching southwardly at right angles to the Erie canal towards the navigable waters of the Susquehanna, at an average distance of about fifteen miles apart, and that the country on their borders was nearly level and possessed great fertility and natural advantages. The natural outlets of the lakes were the only channels through which the surplus products of that fertile section of the state could find their way to the Erie canal.

The legislative committee, to which the petition was referred, gave the subject full consideration and reported that it was expedient, for the purpose of furthering the improvement of navigation, to authorize a survey of the Seneca outlet, as far as Montezuma, and of the works constructed thereon. It was not expected at that time that the State would be willing to construct the canal, but it was considered advisable to make a survey and estimate, so that the Legislature might increase the capital stock of the company to such an amount that the work could be accomplished by individual enterprise, under such restrictions as the Legislature deemed conducive to the public good. Because the State owned a portion of the stock, it was supposed that the Legislature would the more readily approve any action which might enhance the value of that stock.

The Legislators looked upon the petition with favor and passed an act (chapter 168) requiring the canal commissioners to direct a competent engineer in their employ to examine "into the condition of the works erected and constructed upon the Seneca outlet, and to take levels and measure distances along or near the outlet, with a view to the improvement of the navigation from the Erie canal, at Montezuma, to the Seneca lake, at or near Geneva." A clause in the law directed a report to be rendered, "setting forth what would be the most eligible mode, the probable expense, and the consequent advantages of the proposed improvements and the effect such improvements would have on the Erie canal."²

²*Laws of 1824*, p. 180.

In 1825 the canal commissioners submitted a report of the survey and estimate authorized in the previous year, made by David Thomas, the engineer appointed for the purpose, who surveyed two routes from Seneca falls to the Erie canal. From the former point it was proposed to assume a new level and to construct an independent canal from the guard-gates down the shore of the outlet, two miles and twenty-nine chains to Demonts bridge; and thence either northwardly four miles to the Erie canal at Brockway's point, or eastwardly one mile and twenty chains across the swamp to the Seneca river, passing it on a wooden aqueduct near the lower Cayuga bridge, and thence five miles to the Erie canal at Montezuma. The eastern route was considered by the engineer as affording the most convenient navigation, as boats would be enabled to pass without the intervention of a lock from one mile east of Montezuma to Seneca falls. The cost of making the canal and buying the works and improvements of the Seneca Lock Navigation Company was estimated at about \$150,000.

The Assembly, having charge of the report, recommended that the Legislature authorize the commissioners to make a survey for a more northerly or westerly route, before the construction of any work should be commenced. The report was followed by the enactment of chapter 271, authorizing the construction of the Cayuga and Seneca canal, the canal commissioners, however, being restrained from proceeding with the work of construction until a further survey had been made to determine whether some other route from Seneca lake to a point on the Erie canal, north or west of the route surveyed and reported by Mr. Thomas, would be preferable to the one proposed by him. The commissioners were given authority to borrow \$150,000 for the work of construction, provided the sum needed would not exceed that amount, and were ordered to proceed in the matter of appraising the lands, waters and other possessions of the company so that the State could be invested with all the stock, property and privileges belonging to the company. Accordingly, the canal commissioners caused a route to be surveyed, but concluded that the route by the Seneca lake outlet, as surveyed by Mr. Thomas, would afford the best and least expensive communication and one which, in view of the

fact that it furnished the greatest public accommodation to the largest territory, they deemed it their duty to adopt.

After the Seneca Lock Navigation Company had been paid the sum of \$33,867.18 out of the \$150,000 appropriated by the act of 1825, in extinguishment of their claims, the work on the canal was put under contract in June, 1826. Only a few contractors commenced their work and but little progress was made during that season. Almost the whole of the line was relet in May, 1827, but several persons whose bids had been accepted neglected to execute their contracts, while others who entered into contracts, subsequently abandoned them, so that a second reletting was necessary, and the work was greatly retarded until the favorable part of the season had well advanced. A portion of the work, and particularly the lock pits near the Seneca outlet, had been more difficult and expensive than was anticipated. All the locks, excepting two at the Seneca river, were well advanced at the beginning of 1828, and when they were completed in September of that year navigation was opened from the lake to Seneca falls by the completed waterway, and from below the falls to the Erie canal by the old route of the Seneca river. Water was admitted into every part of the canal, from Seneca lake at Geneva to the Erie canal at Montezuma, on November 15, and an uninterrupted navigation was maintained for the remainder of the season. The canal, at its completion, was twenty miles and forty-four chains in length, consisting of ten miles of independent channel and ten miles and forty-four chains of slack-water navigation in the natural channel of the Seneca outlet, with a tow-path on its bank. It had eleven wooden locks, ninety by fifteen feet in size, having seventy-three and a half feet of lockage, while the width of the prism was forty feet at water-surface and twenty-eight feet at bottom, with four feet depth of water. Besides the original appropriation, as authorized in 1825, additional sums aggregating \$64,000 were subsequently appropriated, making a total sum of \$214,000 raised for the project.

In his report of 1825, Mr. Thomas had stated that to facilitate communication with Cayuga lake it was necessary to construct a side-cut one mile and sixty-eight chains long to East Cayuga, where a lock of ten feet lift would be needed to enter the lake. This subject was brought to the attention of the Legislature in

1828 by numerous petitions from the inhabitants of Cayuga, Seneca and Tompkins counties, asking for such a canal. The applicants for the desired improvement stated that at the time of the passage of the act authorizing the Cayuga and Seneca canal to be built, they had supposed that the side-cut was embraced "within the limits of a fair construction to be given to said act" but that the canal commissioners had felt themselves justified in refusing to begin work, until they should have received further legislative instruction. However, it was the consensus of opinion that the great amount of property passing on Cayuga lake to and from the Erie canal and the growing importance of the country bordering on the lake would justify this improvement.

Prior to this time there had been a slack-water navigation from Cayuga lake to the Erie canal, but the petitioners declared that navigation was often greatly impeded by the low water and by sand bars at the northern extremity of the lake, that it was necessary for those navigating the lake by means of steam towboats to leave the towboats at the upper Cayuga bridge, whence navigation to the Erie was rendered difficult and uncertain, not only by the sand bars in the lake, but also by the adverse winds which were a frequent and sometimes long-continued cause of detention.

To demonstrate the wisdom of constructing a side-cut, the petitioners called attention to the Comptroller's report, from which it appeared that the tolls collected on the Erie canal at Port Byron during 1827 had amounted to \$89,066.39, of which \$75,000 had been paid upon property brought down Cayuga and Seneca lakes, and that at least \$35,000 of that sum had been collected upon property which went east from Cayuga lake alone. Adding the tolls upon merchandise passing southward through the same channel, they argued that if the canal fund had profited so greatly by so imperfect a state of navigation, there was no doubt that the contemplated improvement would produce additional revenues far in excess of the interest upon the necessary \$10,000, which was the estimated cost for constructing the side-cut.

The Legislature granted the petition by the passage of an act (chapter 119) directing the canal commissioners to construct a canal on the desired route according to the survey of Mr. Thomas, and appropriating \$10,000 for the purpose. The line was resurveyed in April of that year and work contracted for in the fol-

lowing month. It was completed in July, 1829, an additional appropriation of \$8,000 having been made in that year by an act (chapter 325), this amount in excess of the original estimate being necessary, because a much greater quantity of rock was found within the line of the canal than was anticipated.

Ever since the building of the Cayuga and Seneca canal there have been contentions between the residents at the head of Seneca lake and those at the foot, concerning the water level of the lake, the people of each locality gaining the ascendancy by turns through legislative enactments. At the head there is a marsh extending three miles beyond the lake and occupying the greater part of the valley, which is a mile or more in width. Not only was this marsh considered the cause of much illness, but such portions of it as have been reclaimed have yielded most profitable crops; moreover, the sides of the valley, in which lie the lake and its head waters to the south, are high and precipitous, causing disastrous floods to frequently inundate this territory, including the villages of Watkins and Montour Falls (formerly called Jefferson and Havana, respectively). Under these conditions the people at the head of the lake have always been striving to accomplish the lowering of the lake. On the other hand, the people at the foot of the lake and along the outlet, especially at Waterloo and Seneca Falls, where industries depend on the water-power of the stream, have always contended for any measure that might serve to impound the water and furnish them with more power.

On this, as on all lakes and streams that have been connected with the canals, the State has been held culpable for all extreme fluctuations, whether due to natural causes or not. For eighty years this war has been waged between the two localities. The latest action was the placing of suitable controlling-works in the outlet, which can be so regulated by lift-gates as to allow free passage to the natural flow during floods, and also so as to store the supply after the water has again reached its normal level. But even this device is considered by those at the head of the lake as detrimental to their interests. The following pages will show how large a share this subject has had in the history of the canal.

Before the canal was completed the people at the head of the lake succeeded in having a law passed for lowering the outlet,

which, however, was so conditioned as to render it ineffectual. Chapter 290, Laws of 1828, made it the duty of the canal commissioners to lower the water of Seneca lake two feet below its natural level, by deepening the canal at Waterloo and in the outlet of the lake so as to provide for five feet of water below such reduced level of the lake, one foot to serve as a reservoir to supply water for the summer season, provided that the owners of property at the head of the lake paid to the canal commissioners all damages that would result to mills, hydraulic privileges and other property on the lake and outlet.

The people were not seeking an opportunity to shift the responsibility from the State to themselves, and of course nothing was done. Another attempt for relief was made in 1829, but with no better results. Chapter 360 of that year authorized the canal commissioners to so deepen the outlet of Seneca lake as to lower the water of the lake to a level with the water in the outlet at a point half a mile below the foot of the lake, without increasing the ordinary discharge beyond the amount then discharged by the natural outlet, but under the same provision for paying damages that the law of the previous year contained.

During a part of the season of 1829 navigation in the outlet between Seneca Falls and Waterloo was seriously interrupted, because the water was reduced below its proper level by the large quantity taken by the mills situated at Seneca Falls and Chamberlain's dam. To obviate this difficulty permanent dams, with their tops at true water level, were erected at all the flumes leading to these mills. During the periods of navigation in 1830 and 1831 the water in the outlet continued above its ordinary height and no inconvenience was experienced, but a return of low water during the season of 1832 brought with it all the evils of 1829. For the purpose of obviating the injury which might result thereafter to the mill owners, the latter were given permission at their own expense to place gates in the dams in front of their flumes, through which water could be drawn in the winter season, but which were not to be under their control during low water when the canal was navigable. For the next few years navigation was maintained with difficulty and much time was consumed in bottoming out on several of the levels.

At the head of Cayuga lake there is a stream known as the Cayuga inlet, which, at the time of building the Cayuga and Seneca canal, was navigable for the largest size of boats upon the Erie canal for a distance of two miles from Cayuga lake, at which point it formed a convenient depot for a large amount of property belonging to the citizens of Ithaca and the surrounding country. For a long time there had existed a sand bar at the junction of the inlet and the lake, which had more or less obstructed the passage of loaded boats over it, and especially during 1832 the detentions and interruptions to business from this cause had been felt to a great extent. To expedite the constantly increasing traffic to and from the port of Ithaca, the inhabitants of Tompkins county asked the Legislature for an appropriation of \$5,000 to remove the bar. However, no action was taken in 1832, but in 1834, after receiving similar petitions, the Legislature adopted a concurrent resolution directing the canal commissioners to make a survey and examination of the inlet, and report to the Legislature of 1835 as to the expediency of removing the obstruction and otherwise improving navigation.

As the resolution did not convey the necessary authority to the commissioners to draw money from the treasury to pay the expense, the survey and examination were not made, but the commissioners, being desirous of carrying into effect the intention of the law, proposed to the friends of the project that they should pay the expense of an engineer to make the survey. They accepted the suggestion, but owing to the death of the engineer the contemplated arrangement was not executed. However, the projectors presented to the commissioners two estimates for excavating a channel through the bar and securing it by driving piles and sheeting along the sides. One estimate called for a channel thirteen hundred feet long, eighty feet wide, and of sufficient depth to give six feet of water, at a cost of \$6,877.40, while the other estimate, with a channel of the same dimensions except the width, which was one hundred feet, amounted to \$7,514.

This information was sent to the Legislature of 1835, with the result that an act (chapter 202) was passed, appropriating \$10,000 for the improvement and providing for tolls to be charged on one mile of canal on all freight passing the inlet. Notices were published for proposals for its construction, but no bids were

received at prices that would bring the cost within the appropriation.

After it was understood that the work could not be let for the prices in the proposals received, two citizens of Ithaca, who were desirous that the improvement should be made, because of their large property interests at that place, entered into a contract with the canal commissioners for doing the work at the estimated cost of \$9,700. The contract for the work was let in December, 1835, but owing to high water in the lake no work was done till the fall of 1836, and then but a small portion of it. During the following summer and autumn the principal part of the work was accomplished, and it was completed in 1838, much to the gratification of the people who had occasion to use the waterway for the shipments of merchandise and products of the soil.

There were improvements year by year in order to keep the inlet in a navigable condition; in 1847 an appropriation of \$1,500 was allowed by an act (chapter 251) for keeping open the channel to admit vessels drawing five feet of water, and by a subsequent law in 1866 (chapter 748) there was provided a sum for dredging and removing bars in order to make a depth of seven feet of water, which would conform to the depth of the enlarged Cayuga and Seneca canal. Three years later an act (chapter 822) appropriated \$15,000 from the general fund for a towing-path on the western side of the inlet, and for continuing the dredging for seven feet depth. As more money was needed to complete the work, additional appropriations were granted in 1871 and 1872, and from that year to the present time the necessary repairs and occasional dredging have been attended to. In 1852, by a law (chapter 246), such portion of the inlet as was subject to canal tolls was placed in charge of the canal commissioners.

Turning again to the main canal, we notice that in 1835-6 the locks were in need of extensive repairs, the canal commissioners stating that several of them would have to be entirely rebuilt and asking direction from the Legislature as to whether, in rebuilding the locks, they should make the structures of wood or of stone. The Legislature replied by passing an act (chapter 453) in 1836, authorizing the officials, whenever it became necessary to rebuild

any locks, to build them in a substantial manner of stone, and of the same width as the enlarged locks on the Erie canal. As there were no directions in the act as to the length of the locks, nor the depth of water in the canal to which they were to be adapted, work upon the improvement was delayed and the commissioners continued to repair the old locks as well as they could, so as to keep them passable.

The work of enlarging the Erie canal naturally stimulated among the people of various parts of the state a desire to participate in like benefits, by having the waterways in their vicinities also increased in size. In 1839, three years after the Erie enlargement began, the subject of similarly improving the Cayuga and Seneca canal came formally before the Legislature through a petition received from certain inhabitants of the village of Seneca Falls, appealing for a law that would authorize the enlargement of this canal to the size of the enlarged Erie. The canal board, to which the petition was referred, after deliberately considering the whole subject, concluded that the petition should be granted, saying: "The peculiar connection of the Cayuga and Seneca canal, with the Cayuga and Seneca lakes; the extent of the country thereby penetrated and reached; a judicious regard to the union of lake and canal navigation which this case [presented], together with the kind of vessels best fitted for this twofold use, and a just and fair consideration of the extensive and growing interests of the large and increasing population, whose trade [would] naturally take this route,"³ rendered it highly expedient, in the judgment of the canal board, to give to the canal the full dimensions which were to be given to the Erie canal. However, the Legislature took no action upon the enlargement of the prism until 1854, as will be seen later.

Another subject then receiving serious consideration was the injury and embarrassment to which the canal and its navigation were exposed from the very considerable fluctuations of water discharged from Seneca lake at different seasons of the year. At that time the flow was left to regulate itself, and in times of very high water the inundations were sometimes so great as to lay the banks of the canal, as well as the adjacent lands, under water and materially to injure the whole structure of the canal,

³*Assembly Documents*, 1839. No. 367, p. 1.

while at other times the water was so diminished in volume as to yield an insufficient supply for convenient and constant navigation. These injuries and embarrassments could, it was confidently believed, be entirely remedied by the construction of works at the foot of the lake, properly constructed so as to control and regulate the discharge at all seasons of the year, and especially during the season of canal navigation.

In this way it was deemed certain that the safety of the canal and its uninterrupted navigation could be permanently secured, and the interests of land owners along its borders, and those still more extensive interests dependent on the hydraulic power of the surplus waters of the Seneca river, could be materially benefited. In 1837 the commissioners called the attention of the Legislature to the necessity of improving this condition, but it was not until 1840 that a law was passed concerning the matter. By an act (chapter 302) passed in that year, the canal commissioners were authorized "to improve the Cayuga and Seneca canal, by cutting a channel through the bar at the northeast bend of the Seneca lake to the said canal, and to regulate the height of the water of the lake and the outlet thereof, in such manner as in their opinion [should] be most conducive to the public interests; provided that the rights and interests of persons owning or holding hydraulic privileges upon said outlet, [should] not be injured by such improvement," for which work the act appropriated \$12,000.⁴

With a view to securing the improvement contemplated by this act, the outlet and bar were examined. From this investigation it became apparent that an artificial cut through the bar, in addition to the existing outlet of the lake, which was also an artificial channel through the same bar, would tend to injure and probably to entirely interrupt navigation, by cutting off the navigable communication between the lake and the outlet, unless the new channel should be made navigable by the construction of a lock. It also appeared that the canal could be improved by regulating the discharge of water from the lake and reducing the bottom plane of the upper level.

A plan was therefore projected by one of the chief engineers for the construction of a regulating weir about one hundred feet in length extending across the mouth of the outlet. By this means

⁴*Laws of 1840*, p. 248.

the surplus water could be more rapidly discharged in times of its accumulation; and by gates placed in the weir a portion of the surplus could be retained for the use of navigation till the close of the season, when by drawing the gates the lake could be reduced to its ordinary low water, before the recurrence of spring floods. This plan was presented by the acting commissioner in January, 1841, but a majority of the board deemed it inexpedient to interfere with the flow of water, as such action would result in claims for damage from the owners of low grounds above the lake and also from those interested in the use of water below. They, therefore, decided to improve the canal by deepening the upper level.

The subject was again considered by the Legislature in 1841 and an act (chapter 212) was passed, the first section of which thus provided: "The channel through the bar at the northeast bend of the Seneca lake authorized to be made by chapter 302 of the laws of 1840, shall be made navigable for canal boats, and the canal commissioners may construct a lock therein if they deem the same necessary to make said channel navigable," and the second section declared: "The expenses incurred under this act shall be paid as directed by the act hereby amended, and shall not exceed the amount thereby appropriated."

The sum appropriated was deemed altogether inadequate for the work authorized by the act of 1840, which left to the discretion of the commissioners such plan of improving the canal as in their opinion should be most conducive to the public interests. Accordingly, as the commissioners considered the work itself one of doubtful policy, they deemed it imprudent to commence the execution of it, and, therefore, no measures were taken for opening another channel through the bar from the lake to the outlet.

Having decided that the most feasible course to pursue was to deepen the upper level, this work was partially performed in the spring of 1841. In the following June, however, when the lake had fallen nearly fourteen inches, some temporary fixtures were placed in the outlet to check the flow of water. By this means the surface of the lake on the first of September was about ten inches higher than it was at the same period of the preceding year, but the supplies to the lake had become so reduced by a drought that this surplus was exhausted by the first of October, and thence to the end of the season much difficulty was encoun-

tered in maintaining navigation in this level and in the inlet at the head of the lake. The experience of this season rendered it probable that further excavations in the level and the construction of a regulating weir upon the plan proposed by the engineer would be the best method for remedying these difficulties.

In 1842 the "Stop law" (chapter 114) caused all work on the State canals to cease, except such as was necessary to preserve or secure navigation, until the adoption of the Constitution of 1846, which provided for an annual tax to be imposed so as to raise funds for the canals. This law did not greatly affect the Cayuga and Seneca canal, as no work of general improvement was in progress at the time, and the only matters of immediate urgency were the control of the flow from Seneca lake and the rebuilding of locks. The preservation of navigation depended on a properly regulated supply of water from the lake, and, accordingly, this question continued to receive legislative attention, while by constant repairs the locks were kept in a passable condition.

In 1842 the inhabitants at the head of Seneca lake petitioned the Legislature to have all obstructions removed from the outlet of the lake, and to keep the channel open so that the waters of the lake could at all seasons of the year pass off freely. The petitioners maintained that in the construction of the canal the engineer who located it erred in assuming the low-water mark of Seneca lake to be higher than it really was. This error, they said, had made it necessary to throw a dam across the outlet in order to maintain navigation; and the building of this dam had caused the water to overflow the lands at the head of the lake in the spring and fall, occasioning illness when it receded in the summer.

For the purpose of taking measures to relieve these evils, the commissioners were required by a resolution of the Assembly to examine into the condition of the artificial channel at the foot of Seneca lake, and of the fixtures which had been made for the purpose of keeping up the level of the lake during the previous season of navigation. In pursuance of this resolution, Orville W. Childs, the chief engineer in the employ of the State, was directed to make such examinations, surveys and estimates as were deemed necessary to enable the commissioners to comply

with the requirements of the Assembly resolution. Two plans were presented by the engineer; one contemplated the removal of the lock near Geneva, lowering the lake level of the canal one foot, removing the obstructions at the head of the outlet, enlarging the channel, extending the lake level to Waterloo and regulating the discharge of water at that place; the other plan provided for the continuance of the lock near Geneva and the placing of a regulating weir at the upper end of the outlet.

The commissioners stated that, while either of these plans would in all probability overcome the difficulties of navigation, the first plan only would to any considerable degree relieve the petitioners from the overflow on their lands, the other plan being considered one that would afford them but little relief. The engineer's estimated cost of improvement, according to the first plan was \$10,316.90, while that for the regulating weir was \$2,099.49.

As the commissioners were of the opinion that further legislation was necessary to fully carry out the work of improving navigation, the question was laid aside, but only temporarily, for in 1844 the Legislature was once more stirred to action. In that year the petitioners again applied for relief, and a law (chapter 313) amending the act of 1840 and repealing the act of 1841 was passed. This act authorized and required the commissioners to proceed with the improvement according to the plans for removing the lock and obstructions near Geneva, deepening, enlarging and extending the lake level to Waterloo, and regulating the flow there, as embodied in Mr. Child's report of 1842. The work was put under contract in 1844, and completed on April 1, 1845, a regulating weir also having been constructed in the State dam at Waterloo. But there was no alleviation of the troubles previously experienced and another complaint was forwarded to the Legislature of 1845, which, however, elicited no action.

In the following year petitions from the inhabitants of Waterloo and Seneca Falls, and remonstrances from citizens of Chemung county were received, repeating the same complaints and arguments as have always been used in this contest. The people on the outlet represented that their hydraulic privileges had been greatly injured, and navigation of the upper level of the canal impaired by the artificial channel constructed at the lake, and

they requested the erection of such regulating weirs as would secure a more uniform flow and keep up the waters of the lake so that navigation would not be obstructed in dry seasons. Those residing near the head of the lake contended that the waters were still obstructed and that although the upper level of the canal had been lowered and an artificial outlet completed, pursuant to the law of 1844, the flow was kept back and the water did not sink to its natural level by reason of dams and obstructions, with the result that much illness had been produced and low grounds had been flooded.

Under such conflicting statements the legislative committee on canals had much difficulty in arriving at any satisfactory conclusion. The report of the committee said:

" . . . the State has no moral right to raise the waters of the lake above their natural level by obstructions, if such raising of the waters produces as represented, great sickness, nor to injure property at the head of the lake without just compensation.

" On the other hand, the owners of the hydraulic works on the Seneca river are entitled to ask that their privileges in the use of the water flowing from the lake should not be unnecessarily injured or made irregular by State works." The committee introduced a bill to regulate the flow of water by the construction of weirs at the outlet of the lake, but it failed of favorable action.

In 1847 the condition of the locks was such as to necessitate rebuilding. Some of them had been in use seventeen years, being from time to time repaired by substituting new for old and decayed parts, and for several years they had been maintained at considerable expense. It will be recalled that an act, passed March 25, 1836, had provided that, whenever it should become necessary to rebuild the locks on the Cayuga and Seneca canal, the canal commissioners were required to rebuild the locks in a substantial manner with stone and of the same width as the enlarged locks on the Erie canal. It will also be remembered that the commissioners had delayed action, awaiting legislative instructions in regard to the lengths of locks and the depth of water, and that the "Stop law" had removed the possibility of enlargement by depriving the commissioners of the necessary money. In their annual report for 1846, the commissioners said:

"The width of the chamber of the present locks is 15 feet, and that of the enlarged locks on the Erie canal is 18 feet. The original width of the inland portions of the Cayuga and Seneca canal, at bottom was 28 feet, and 40 feet at the surface of the water, and with sides sloping $1\frac{1}{2}$ horizontal to one foot in perpendicular height. The slope on the face of the banks having been somewhat changed by use, the present bottom width is probably less, and at the surface it is greater than that above stated. Heavily loaded boats frequently rest on the bottom or sides of the canal while passing each other. As the present width of the canal is insufficient for the passage of boats of greater width than can pass the present locks, the Commissioners are unable to discover that very great advantages would be derived from an increase in the width of the chamber of the locks, without increasing the width of the prism of the canal sufficient to admit the passage of two boats having a width corresponding to that of the enlarged chamber."^a

As large expenditures would be necessary if the old locks were repaired and continued as in previous years, and, as the law of 1836 had authorized simply widened structures, the commissioners considered that the plan upon which the locks should be rebuilt was so important as to demand further legislative direction. At their solicitation the Legislature enacted the following law (chapter 348):

"§ 1. Whenever, in the opinion of the Canal Commissioners, it becomes necessary to substitute new locks for the old locks in the Cayuga and Seneca canal, the commissioners shall cause minute estimates to be made of the cost of rebuilding the lock or locks on the plan prescribed by the act . . . passed May 25, 1836, and also minute estimates of the cost of constructing said locks of composite of the same dimensions of the enlarged locks on the Erie canal, which estimates shall be submitted to the canal board, and when approved by that board, and if the expense of the composite locks of the enlarged size shall not exceed the expense of the stone locks as prescribed by the act of May 25, 1836, aforesaid, the canal commissioners shall proceed to construct the

^a*Assembly Documents*, 1847, No. 20, pp. 54-55.

lock or locks on the enlarged plan, and the cost thereof shall be charged to the fund appropriated to ordinary repairs.

"§ 2. The said commissioners may diminish the number of the said locks, or alter their location, if in their judgment the interests of the state will be promoted thereby; and the aggregate expense of re-constructing the necessary locks and putting the said canal in navigable condition will not be increased thereby."

Believing that the time had arrived when it was necessary to substitute new locks for the old ones, the commissioners, in July, 1848, directed Charles W. Wentz, resident engineer, to make a survey and to estimate the cost of constructing locks upon the plan prescribed by the act of 1836, and also to prepare an estimate for composite locks upon the plan contemplated by the act of 1847. By the report and estimate of the engineer, the aggregate cost of the cut-stone locks, prescribed by the act of 1836, was \$188,769.64 and of those upon the composite plan, as directed by the act of 1847, the aggregate cost was estimated at \$139,416.07, showing a difference of \$49,353.57 in favor of the composite plan.

In accordance with the provisions in the act of 1847, the estimates of the engineer were submitted to the canal board and on the twenty-fifth day of July, 1848, the board approved and recommended the construction of the composite lock of the same dimensions as the enlarged locks on the Erie canal. The commissioners, therefore, proceeded to have the two locks at Waterloo rebuilt in 1849 under the new plans, three others also being rebuilt shortly afterward. By the plan adopted, the lock near the foot of Seneca lake was dispensed with, and the discharge of water was regulated at the Waterloo dam, a plan originally contemplated by the canal commissioners in the construction of the canal. The need of a lock at Chamberlain's dam was also obviated by increasing the lift of the one at Seneca Falls, thus bringing the two levels between Waterloo and Seneca Falls into one. To remove the difficulties attending navigation in the slack-water level, below lock No. 9 and across the foot of Cayuga lake, the engineer was directed to make examinations and suggest a remedy. He proposed a plan for an independent canal from the head of lock No. 9, crossing Seneca river by an aqueduct and running thence to intersect the Montezuma level, a distance of four miles. With the

¹*Laws of 1847*, pp. 450-451.

adoption of this plan and its subsequent execution three more locks could be dispensed with, reducing the number from twelve to seven. Of this project the commissioners said: "If the Legislature should direct the improvement, the expense would be \$26,816.06 more than the estimated cost of rebuilding the stone locks contemplated by the act of 1836, a sum which, in the judgment of the commissioners, bears a small proportion to the yearly cost of superintendence and repairs to the locks, which will be dispensed with."^a

The subject was presented to the Legislature of 1849 and an act (chapter 213) was passed, authorizing the canal commissioners, "if they [should] deem the interests of the state to require it," to construct the independent channel, the expenses to be paid as directed by the act (chapter 348) of 1847. By the authority thus conveyed the commissioners directed the necessary surveys and estimates to be made. The length of the improvement was about three and one-half miles and the estimated cost of the work, including the aqueduct over the Seneca river, was \$128,877.37. The estimates were for a channel of the same size as the existing canal, but the aqueduct was planned to conform to the dimensions of the enlarged Erie canal.

Additional surveys and examinations were made in 1851 with a view of making an entire separation from the river below lock No. 9 and continuing the proposed independent line of canal upon the south side of the river, rather than upon the north side as previously planned. This would reduce the length of the aqueduct required at the crossing of the Cayuga outlet, by passing the water of Seneca river through the old canal and making the junction of the two streams below the proposed aqueduct. It was believed that this plan would lessen the difficulties arising from high water in the Cayuga lake, of which there had been much complaint by those residing on the borders of the lake. This plan also obviated the need of the dam and tow-path bridge below lock No. 9, and the survey demonstrated the entire feasibility of the new plan at a cost within the estimates for the line upon the north side of the river. However, nothing appears ever to have been done toward executing either of these plans.

^a*Assembly Documents*, 1849, No. 40.

In the original construction of the canal, or by permission given subsequently by the canal commissioners, a connection was formed and maintained at Seneca Falls between the canal and the river below the upper lock, by which boats could pass through the race and pond to the mills located on the opposite side of the river. In the construction of the enlarged locks at this place it became necessary to close this connection, because an increased height of water in the canal resulted from equalizing the lifts of the locks so as to dispense with one at Chamberlain's dam. In order to continue the connection with the river at this point the canal board, on application of the proprietors of the mills, directed the construction of a side lock, which was completed in 1851.

In this year there yet remained five locks to be rebuilt, which had required extensive repairing and the utmost watchfulness and care to maintain them in a navigable condition. It was apparent that they were liable to give way at almost any time and, if this should occur at the height of the season of navigation, it would cause a suspension that would be disastrous. The commissioners urged some action and they were of the opinion that, if it was thought advisable to delay still further the construction of these locks on the enlarged plan, some adequate provisions should be made for repairing them in such a manner as to leave them in a reliable condition for use.

At this time the old contention reappeared; extra measures were taken to meet the request of those who had petitioned the Legislature for relief from water overflowing their lands at the head of Seneca lake. The lake level from Geneva to the lock was bottomed out and there was removed the dam of brush and stone, which had been built across the outlet to raise the waters of the lake in order to maintain navigation on the lake levels, not only of this canal but also of the Crooked Lake and Chemung canals, which terminated in this same lake. It was hoped that this action would settle the vexed question of high water in the lake for many years.

In 1853 an act (chapter 620) appropriated \$20,000 for the expense of rebuilding locks, so that in 1854 two more enlarged locks were brought into use—one in the village of Seneca Falls and the other at East Cayuga. This last, with the improvement of

the Montezuma level of this canal under a law (chapter 16) passed in 1854, opened navigation for enlarged boats between Montezuma and Ithaca. This work of improving the Montezuma level, seven miles in length, consisted in thoroughly bottoming out and widening, and in straightening at many points, for the purpose of facilitating the passage of boats of enlarged size. The old lock at the east end of the Geneva level was discontinued and the level extended to Waterloo. The remaining three locks were enlarged in 1855.

In the chapter dealing with the first enlargement of the Erie canal there are told the events that led to legislative action in 1854, which was inaugurated in order that the languishing work on the several canals might be pushed with vigor.

At an election held on February 15, 1854, the people ratified an amendment to section three of the Constitution of 1846, in which it was stated that "the Legislature shall annually during the next four years, appropriate to the enlargement of the . . . Cayuga and Seneca canal." This was considered a judicious move, now that the lock enlargement was completed, and in that year the Legislature enacted a law (chapter 329), providing for the enlargement of the canal, appropriating \$101,000 for the purpose, an additional sum of \$100,000, available after October 1, 1854, having been provided by chapter 330. The law specifically stated that the canal should "be enlarged to the general dimensions of seventy feet in width upon the surface by seven feet in depth, except where, in the opinion of the canal board, greater dimensions [might] be necessary to supply a sufficient quantity of water for the purpose of navigation and for the construction and completion of such basins as [might] be deemed necessary, by the canal board, and also, except in localities where a due regard to economy and the interests of the state [required] that such specified width should, in the opinion of the canal board, be varied." The law also directed that "said work for the enlargement of the Erie, the Oswego, the Cayuga and Seneca canals, and the completion of the Genesee Valley and Black River canals, [should] be put under contract and progress to completion, so as to bring the said several improvements into use at the same time as nearly as [might] be."

The preliminary work, such as surveys and estimates, was completed along the entire length of the canal in 1854. The estimated cost was \$539,482.96, which included \$32,345.20 for contingencies. A section of 12.11 miles, embracing the most expensive portions of the line, was put under contract during the same year, the cost for this distance being estimated at \$323,452.06 (not including contingencies), while the estimate to complete the remaining 10.41 miles was placed at \$183,685.70, for which contracts were entered upon later. In 1855 there was passed an act (chapter 23) authorizing the commissioners of the canal fund to negotiate loans to defray the cost of the enlargement directed under the law of the previous year.

By the terms of the contracts for enlargement, the several portions of work were to be completed on the first days of April, 1856, 1857 and 1858, respectively. The work on most of the contracts progressed slowly in consequence of the limited means available for the purpose. By the first of July, 1856, all funds were exhausted, and some of the contractors suspended operations, but chapter 148 of that year's laws had appropriated \$100,000 for the fiscal year beginning October 1, so that others of the contractors continued their work, receiving drafts payable on the twentieth of October, 1856. In the following year an act (chapter 365) provided an appropriation of \$212,119.42 for the fiscal year beginning October 1, but by the first of November this also was exhausted, except \$23,430.15, an amount too small to prosecute the work on all of the contracts. Notice was therefore given to all of the contractors, except those building the dam and guard-gate at Seneca Falls, and the pier at Geneva (pieces of work which were considered necessary in order to maintain navigation), that until further means were provided, no more estimates would be made on their contracts after paying for work done in October. The dam and guard-gate were completed in September, allowing boats of the largest class to pass through to the head of Seneca lake and up the Chemung canal as far as Havana.

As we have seen in the account of the Erie canal, the work of improving the several State waterways at this time was almost at a stand-still. The cost of completion was steadily increasing beyond the amount anticipated; the canal debt was rapidly growing; the tolls of 1857 had fallen nearly half a million dollars

short of meeting even the constitutional requirements for paying sums toward interest and sinking fund; and the season of 1857 had been most disastrous to boating interests. These circumstances led to the passage of the following resolution by the Assembly, on March 16, 1858:

"Resolved, That the State Engineer and Surveyor be and he is hereby requested to report, at the earliest practicable period, the amount of money necessary to complete the unfinished canals; also, the amount of work done for which no provision for payment is now made."

In answer to this resolution, estimates were made of the cost of completing all work on the canals. The total amount needed to finish the enlargement of the Cayuga and Seneca canal, according to this statement, was \$324,336.44. Of this amount \$161,677.24 (evidently misprinted as \$161,577.24 in Assembly document) was for work yet to be done on existing contracts, \$60,000 for engineering and land damages, \$44,335.44 for contingencies, being twenty per cent of the two previous amounts, and \$58,323.76, which was the percentage retained to December 31, 1857.¹⁰

After considerable delay, operations were again resumed. The Legislature of 1859, by an act (chapter 149), provided \$66,615. the law stating that the money should be applied to the payment of work done and materials furnished after the first of March of that year. In 1860, by an act (chapter 213), there was a further appropriation of \$138,714.

The canal enlargement was now rapidly nearing completion and it was believed that the remaining work could be finished before the opening of navigation in 1863, if funds were appropriated for the purpose. The work had now been so nearly completed that a survey was begun for the final maps and continued as fast as it could be done without increasing the expense of the engineering department. An additional appropriation of \$30,000 was provided under an act (chapter 137) of 1862. Another law of that year (chapter 169) declared that on the first day of the following September all contracts for the enlargement and completion of the canals of the state should be considered finished, and that no more work should be done, under the

¹⁰*Assembly Journal*, 1858. pp. 521-522.

¹⁰*Assembly Documents*, 1858, No. 116, p. 3.

pretense of enlarging or completing them. On that date, all work on this canal had been completed with the exception of a few small portions. The probable cost of finishing one section (No. 7), according to the plan of enlargement, was \$5,000. Here the prism was left but forty feet wide in places and the towing-bank was barely of sufficient height to retain seven feet of water. Little difficulty was experienced, however, in navigating this portion of the canal, but, as a precaution against breaks, it was deemed advisable that the banks should be raised to their proper height. The bottom between Cayuga and the Free bridge was not lowered to the proper grade when work was stopped, and later this section caused trouble at times of low water, which was remedied in 1871 by further deepening.

In 1863-4 the business of the canal showed a marked increase, despite the condition of the composite locks, which caused much trouble and expense. It was found that the badly constructed dry walls of the chambers allowed such quantities of water to press against the rear of the lining plank that, in emptying the locks, the lining constantly burst off, or the anchors and posts gave way. It was thought that true economy would be best subserved by dispensing with these dry walls altogether, and substituting for them rough and cheap but substantial walls of cement masonry with wooden fenders, after the plan adopted on the Chenango and Crooked Lake canals.

In the question of lock enlargement, which was debated in the Legislature of 1864, the Cayuga and Seneca canal was included in the resolution which the Assembly addressed to the canal board, as to the necessity of enlarging locks upon various canals. However, the board reported that, as the locks upon this canal were of the same capacity as those of the Erie and Oswego, no recommendation concerning them would be made at that time.

During 1866 lock No. 6 at Seneca Falls was the cause of much trouble, owing to the pressing of side walls into the chamber of the lock. This was a composite lock, the chamber walls being of stone, laid dry, and the front faced with timber and plank. Since 1861 this lock had been bailed out four times at great expense, and in 1862 the timber work was removed and new timber substituted, with concrete placed between the wall and the face lining. In the spring of 1866 a part of the concrete was removed, the

timbers hewn down and but one course of lining put on instead of two. In this condition it was used during that season, but not without difficulty and delay. It was urgently recommended that the dry masonry be taken up and relaid in cement on the plan adopted for rebuilding locks upon the Chenango canal, and in 1867 this recommendation was fully carried out. An act (chapter 752), passed in this year, authorized the canal commissioners to raise the State dam at Waterloo to the height of the original dam, but not to raise the lake above its natural height. By this means the people interested in water-powers at Waterloo attempted to advance their interests, but, as will be seen a little later, the controversy was still to be waged for years to come.

An amazing increase in the tonnage of property moved upon the canal was noted in the year 1866, when the number of tons transported was 368,233, an increase of 175,921 tons over the previous year. This growth continued till 1869, when 533,516 tons were carried. This was undoubtedly due to the fact that this canal furnished a line of transportation from the Pennsylvania coal regions to the Erie canal. A boat could navigate the North Branch canal in Pennsylvania to the Junction canal, thence through the Chemung canal and Seneca lake to Geneva and finally reach the Erie. This canal was also connected with Ithaca, near the head of Cayuga lake, and with the Crooked Lake canal, running from Dresden on Seneca lake to Penn Yan, which also furnished an extensive area from which to derive patronage.

In 1869 contracts were let for rebuilding four locks. At this time the construction of a new pier at Geneva was in progress, which, when completed, would greatly accommodate the boatmen and others navigating Seneca lake. As provided for in the act (chapter 767) of 1870 and the act (chapter 778) of 1871, the work of protecting the berme banks along the north shore of Seneca lake was prosecuted in the latter year. During the floods early in the season of 1870 the lake overflowed the narrow bank separating it from the canal, and a considerable quantity of earth and gravel was washed into the prism. The berme was raised about three feet and protected on its lake side by a substantial wall of loose stone. The appropriation of \$10,000 for this work was expended and the \$2,000 necessary to complete the job was appropriated by an act (chapter 343) in 1872. Other work, as directed by the

act of 1871, was the construction of a new dam at Waterloo and a vertical wall at Seneca Falls, for which the law provided \$10,000 and \$5,000, respectively.

An act (chapter 877) of 1869 had provided \$5,000 for taking out original material in the bottom of the river near Waterloo. After expending most of the money in dredging all that could be dredged, the balance being rock which, it was thought, could not be taken out without coffer-dams, the officials in charge of the canal recommended appropriations to finish the work, because the Seneca river became so low at times that loaded boats were grounded and their draught had to be decreased, by resolution of the canal board, to five feet and nine inches, and still later to five feet and six inches. Boats came down Seneca lake, the only feeder for the head of the canal, in tows of from thirty to fifty, and when they entered the canal it became necessary for the section superintendent to detail his entire force, except lock-tenders, to assist in their passage over the bars and through the locks. Although this service was always rendered with the greatest promptness, despite the conditions of time or weather, no amount of attention on the part of the superintendent could remedy the disastrous effects of low water on the navigation of this canal. It was estimated that, during the unprecedented drought in the summer of 1872, from 200,000 to 250,000 tons of freight, chiefly coal, was offered for shipment, and would have been transported over this canal and over portions of the Erie and Oswego canals if the draught of boats had not been thus restricted by low water.

Other commercial interests besides coal, that were dependent upon the navigation of this canal, were for a time sorely crippled by this deplorable condition of affairs. With perfect navigation, the canal was the natural and the cheapest route to the people of this state for the great and rapidly growing coal trade of Pennsylvania, and there was an immediate demand for legislation which would prevent a recurrence of this trouble. The tonnage over this canal was large; it had been increasing with great strides up to 1869, and the advocates of these improvements considered that it would continue to grow in order to meet the demands for coal consumption, consequent upon a multiplying population and the rapid development of manufactures. From a

commercial point of view, they deemed that the importance of the waterway to our own people could not well be overestimated; and if the canal was to be preserved and to retain its commerce, it was essential that its material needs, upon which the very existence of the canal depended, should be fully and abundantly supplied. As early as 1870 lines of railway were projected for the purpose of diverting traffic into other channels, and once built and in successful operation, a trade equal to their carrying capacity would be permanently lost to the canal.

With a view of remedying the difficulties encountered in navigation, the Legislature under an act (chapter 766) in 1873 appropriated \$40,000 for the construction of a permanent and tight dam in the Seneca river at or near the existing dam at Waterloo, \$25,000 of the amount having been appropriated for the same purpose by previous acts: \$10,000 under chapter 778, Laws of 1871, and \$15,000 under chapter 343, passed the following year. The law, as originally drawn, would undoubtedly have been productive of great good, but before its final passage a clause was inserted requiring the spillways in front of mills to be put three feet below the crest of the main dam. The engineers reported that this arrangement would give to the mill owners as great, if not greater power, and better opportunities than they previously had, to reduce the surface of Seneca lake, with results that would prove detrimental instead of beneficial to the interests of the canal. Consequently nothing was done under this act.

In the year 1874 the Legislature transferred \$25,000 of the \$40,000 appropriated under the act of the preceding year, for the purpose of dredging the river channel. The law stated that the money was "to be used under the direction of the commissioner in charge, as in his judgment [should] be for the best interests of the state in removing rocks or dredging within the prism of the canal between Seneca Falls and Geneva, for the purpose of improving the navigation of the canal." As the canal had been completed throughout its entire length according to the plan of enlargement twelve years earlier, the commissioner deemed that work of this nature was unnecessary, and, accordingly, did nothing.

Although the canal was favored with an abundant supply of water, yet the recurrence of a long continued drought, like that

of 1872, was feared and up to 1876 recommendations were annually made to the Legislature for a law providing for the rebuilding of the dam at Waterloo, but without the restrictions and requirements which were included in the act of 1873. The dam was considered the most important structure on the canal, as it controlled the waters of the lake, and canal officials were of the opinion that it was for the interests of the State to control the waters at this point, and oblige the owners of hydraulic power to draw from the surface instead of from canal bottom, as they were then doing, by building a dam of the same height as the one then existing, eight feet above canal bottom, with weirs across the raceways one foot lower than the crest, thus securing to both navigation and mill owners a reliable flow of water during dry seasons. The plan proposed was estimated to cost \$20,000, but the Legislature enacted no further laws upon the subject.

These were the years when the question of abandoning the lateral canals held sway in canal affairs, but the 1874 amendment to the Constitution of 1846 exempted the Cayuga and Seneca canal from the latter part of these considerations, by placing it among those that were never to be sold. However, the Crooked Lake and the Chemung canals, its two contributing feeders, were among those abandoned, and shortly afterward the receipts from the Cayuga and Seneca canal were decreased enormously, in large measure because it was deprived of the trade which had come by those two routes. The tolls collected on this canal in 1876 were \$10,974.35, and two years later they had fallen to \$2,908.39. Had it not been for the constitutional protection, it is highly probable that the canal would have been placed among the abandoned laterals.

The canal was continued in good navigable order, with a full supply of water, and in 1877 the expenditures for ordinary repairs were less than for any year since the enlargement, and yet the canal was in better condition than usual. This was the beginning of a period of retrenchment succeeding an investigation of canal expenditures.

For several years there is nothing of great importance to record. In 1878 it was necessary to make the towing-path at Geneva safe for the boatmen to drive their teams along that portion of it where the railroads so encroached upon the State lands, narrow-

ing the towing-path and placing their tracks near the canal in order to transfer coal, that horses unaccustomed to the locomotive could not be controlled. A change was made in the towing-path so as to allow the Syracuse, Geneva and Corning railroad to construct an elevated track with pockets and chutes for handling the coal. This involved the necessity of constructing two swing-bridges—one at either end of the elevated track—and a towing-path on the berme bank between the bridges. The work of building these structures and of changing the towing-path was executed and paid for by the railroad company.

Nothing of much importance happened on the canal, beyond small repairs and dredging in sections wherever needed for good navigation, until 1882, when the central portion of the upper State dam at Seneca Falls was taken down and relaid. The dam had been in existence for twenty-five years, being built by the State so as to supply water to the mills from which, in order to supply the canal, the natural flow of Seneca river had been diverted. The first discovery of the dangerous condition of the stone work was made when the water was turned to fill the canal at the time of opening navigation in 1882. An investigation by an engineer showed that the central portion of the dam "had been crowded down stream about sixteen inches at the top, the six upper courses of the face stone having become separated from the backing, while at one point near the centre several stone had been forced entirely out." The engineer further said that "at the time the dam was constructed, an attempt had been made to reinforce the masonry by the addition of a rear buttress, but the bond of the face stone, with this and the backing being imperfect, the settling away of the face caused an open joint, which the action of the frost annually widened until it admitted a volume of water that endangered the whole structure and necessitated the rebuilding of about one-third of the dam."¹

In this year an engine belonging to the New York Central and Hudson River R. R. Co. went into an open draw at the crossing of the canal at Cayuga on the morning of the first of June, causing a delay of nearly six days to navigation at this point.

Two years after the trouble with the dam at Seneca Falls, the State structure at Waterloo, which held back the waters of Seneca

¹*Senate Documents*, 1883, No. 9, pp. 83-84.

lake, was damaged by a flood, about forty feet of the upper portion being carried away on April 12. The water poured through the breach with considerable force, wearing away the material and endangering the remainder of the dam. The flow was checked as quickly as possible by the construction of a loose stone dam around the break and as near to it as possible, and later in the season, after Seneca lake had been drawn down, the break was repaired in a most substantial manner. On account of low water in the Seneca lake level during August of this year, 1884, it became necessary to restrict the draught of boats to five and a half feet.

To improve this portion of the route required considerable expense for dredging. After 1887 sums of considerable size were provided for the improvement of this waterway. Throughout the whole canal system a renewed activity was manifest, in which this branch had a small share. In 1887 the Legislature passed an act (chapter 113) appropriating \$15,000 to remove the obstructions between Seneca lake outlet and the upper dam at Waterloo, and for improving locks Nos. 1 and 2, the work for the latter to be done by contract. It was found on making a survey that the lock work was of a character that could not properly be done by contract and it was not let. The Legislature was recommended to so amend the law that authority would be given to the Superintendent of Public Works to do this work at his discretion. A further appropriation of \$25,000 for improving the canal, whenever necessary, was provided in 1888 by an act (chapter 416).

In the same year, by the passage of chapter 325, the unexpended balance of the appropriation of the preceding year was authorized to be used towards dredging and excavating the channels of Seneca river and of the Old Bear race at Waterloo. A sum for completing the work at these places was appropriated by an act (chapter 461) in 1889, which applied the unexpended balance of the appropriation (chapter 416) of 1888 towards this object, under the provision, however, that the owners of land in the channel should release to the State the right to use the race for canal purposes only; the channel to be thereafter a public highway for the purposes of navigation only and to be known as the South Waterloo channel of the Cayuga and Seneca canal. The work at Bear race was let in December, 1888, and about one-half the excavation had been done up to February 11, 1889, when

the work was stopped by injunction. The contract was canceled in December and a final account rendered for work done.

Other laws enacted in 1889 were: an act (chapter 110) amending section two of the act (chapter 416) of 1888 so as to give the Superintendent of Public Works discretionary powers in the matter of lock improvement; an act (chapter 493) for improvement as provided for in the act (chapter 113) of 1887, and appropriating \$14,608.75, the balance remaining on hand from that act; an act (chapter 568) appropriating \$15,000 for necessary improvements; and an act (chapter 150) providing for an appropriation of \$6,000 to repair what was known as the second level, and also the State ditch of the canal. In 1890 there was a manifestation of still further activity towards improving the canal, and an act (chapter 168) had an appropriation of \$10,000 included within its provisions, the work of improvement being executed at such places as the interests of commerce most required. In 1891 the appropriation covered by the act (chapter 150) of 1889 lapsed, as nothing was ever done under its provisions, and the ditch was cleaned by the Superintendent of Public Works from other funds. There were no additional appropriations by the Legislatures of the next three years, except one of \$2,000 for rebuilding the State pier at the head of Cayuga lake, the condition of the canal being generally good.

In 1894 an act (chapter 424) appropriated \$15,000 to be used in repairing and strengthening the berme bank and breakwater at the foot of Seneca lake between the outlet and the junction of the canal with the lake. This work, which consisted of a heavy sea-wall of quarry stone along the north end of the lake, was completed in 1897, a further appropriation of \$15,000 having been made in 1895 (chapter 142). At completion, the wall was continuous for about seven thousand seven hundred feet.

In 1895 several laws were passed authorizing various pieces of work. One was an act (chapter 82) directing the expenditure of \$2,500 for repairing and raising the berme bank and highway from a point near Cayuga to Mud lock; another was an act (chapter 308) appropriating \$20,000 to improve "the channel of Seneca river and Cayuga and Seneca canal by dredging and excavating from and through the outlet of Seneca lake at the northeastern corner thereof to Island D in said river, and the entrances into

the north and south branches of the Cayuga and Seneca canal," and another act (chapter 512) appropriated \$20,000 to rebuild the vertical wall on the towing-path side, second level, and to repair bridges, culverts and other structures. The unexpended portion of this amount was to be applied to the improvement of the South Waterloo channel (Old Bear race), pursuant to an act (chapter 461) of 1889. This appropriation for improving Old Bear race was passed because the injunction, which prevented the accomplishment of the work in 1889, had been dissolved. In 1894 also, by act (chapter 572), funds had been provided for the latter improvement by the balance left over from an appropriation of \$15,000, made for the purpose of "rebuilding all or a portion of the wall between the Cayuga and Seneca canal and the Sackett and Bascom race on the level next below lock number three, and excavating and concreting, if necessary, the bottom of the canal on said level," which was located in the village of Seneca Falls.

In 1896 there was an appropriation of \$2,500 by an act (chapter 949) for dredging, cleaning and repairing the State ditch, before alluded to. To improve the channel of the canal by dredging and excavating from its terminus at Geneva to a point at the intersection of the canal with the outlet of Seneca lake, the Legislature of 1897 provided \$10,000 under the provisions of chapter 558. An act (chapter 606), passed in 1898, allowed an appropriation of \$10,000 for the purpose of dredging and removing bars and other obstructions in the branch leading to Cayuga lake. The sum was insufficient to defray the cost of completion and an act (chapter 417) was passed in 1900, appropriating an additional sum of \$4,827.16. The work under these acts consisted in dredging the basin below lock No. 10 and extending the canal into the lake in order to secure proper depth of water for navigation, and also in excavating the prism of the canal proper from lock No. 10 to the junction of the main canal, a distance of about two miles. This portion of the line had become so filled by the accumulation of years that navigation by fully laden boats was extremely difficult.

The season of navigation in 1899 was one of the most prosperous the waterway had experienced for a decade. In that year the much-mooted question of regulating the waters of Seneca lake

again came to the fore. The Superintendent of Public Works had recommended the erection of such structures as might be necessary to provide for an additional storage of water to the height of two feet above the crest of the existing Waterloo dam. A survey was ordered, by an act (chapter 501) of that year, to ascertain the effect of such a structure on the low-lying lands at the margin of the lake. There were prepared plans and estimates of controlling-works, to be placed in the channel just below the junction of the canal and the outlet of the lake, and during the legislative session of 1900 the erection of these works was authorized (chapter 680), an appropriation of \$97,000 being made for the purpose. The plans included a guard-lock to be located beside a series of lift-gates, so constructed as to permit a wide and free channel for the passage of floods, or to impound the waters, when needed. The work was let on September 12, 1900, to contractors whose price was \$66,573, but as they failed to properly proceed with the work, the sureties took possession and through another contracting firm prosecuted part of the work. After much delay the structure was finally completed early in 1903. This marks the latest phase of the contention, which has extended over a period of eighty years, between the people at the two ends of Seneca lake. Recent dredging in the channel had uncovered some of the marsh land at the head of the lake, which was being successfully reclaimed and cultivated so that the disappointment in that section was the more deeply felt. However, since completion, it has been found necessary to close the gates but once for a short period.

By an act (chapter 662), which became a law in 1900, the sum of \$45,000 was appropriated for the construction and extension of the tow-path from its terminus southerly along the west shore of Geneva harbor about twelve hundred feet to the opening in the long pier. This improvement was begun soon afterward and was finished in 1902. The very high water throughout the season of 1902 was accountable for the inundation of the towing-path at many places between Geneva and Waterloo. This necessitated the work of raising the tow-path and covering it with gravel for a distance of four miles.

In the recent plans for remodeling the State's waterways, the Cayuga and Seneca canal was not at first included, but, at the

request of the inhabitants of that locality, the supply bill of 1905 (chapter 700) contained an appropriation of \$4,000 for making surveys and plans for extending the improved route to Cayuga lake. Estimates have been prepared for channels of seven, nine and twelve feet depth from the new line of the Barge canal to Cayuga lake, with a connection to retain the existing canal between Cayuga and Seneca lakes in its present condition. However, no decision has yet been reached to indicate what the ultimate action may be.

CHAPTER IX.

THE BLACK RIVER CANAL.

Including both the canal and Black river improvement, and the storage reservoirs of the Black river territory from the inception of the project to the present time.

As the Erie canal neared completion and as its benefits began to be fully appreciated, there arose a cry from all parts of the state for canals with their attendant blessings. The people of the Black river region were not remiss in seeking for their localities a share of the prosperity that was so apparent along the route of the Erie. Consequently the Legislature of 1825 was in receipt of several petitions from the inhabitants of Herkimer, Oneida, Lewis and Jefferson counties, who desired public aid in making a canal to connect the Black river with the Erie canal. These petitions were prompted, no doubt, in part by the attitude of Governor Clinton, who, in his annual message of that year, suggested such a connection.

The friends of the measure argued that the country was one of the most fertile parts of the state; that it had a very considerable population, and was capable of sustaining four or five times as many; that it abounded in valuable timber, besides a great amount of iron ore of good quality. They raised the point that the manufacture of iron, if a canal were built, would steadily increase and that the tonnage, therefore, of this article, of agricultural products, of lumber and of manufactured goods of various kinds would give an amount of tolls amply sufficient to pay a fair dividend upon the outlay of money invested. The area of country that would be tributary to the proposed canal and feeder was estimated at two thousand square miles, and its population, by the census of 1825, at 28,554.

The memorialists also mentioned several other advantages to be obtained by opening a canal; one was the increase in value of public lands. The Moose river tract alone contained 219,000 acres, to which there was no easy access. Consequently it was

unsalable and not increasing in value, but it was believed that a canal would bring it into market at an early day and at an advanced price. Another benefit was the permanent and ample supply of water which this canal would afford to the Rome level of the Erie canal. Time has proved that this was the greatest benefit of all of those advanced, for the very existence of the Erie has largely depended on this supply. As transportation on the Erie increased and the nearer streams diminished, this source of supply became of more consequence every year. The petitioners also believed that such a canal would assist in securing the northern frontier, which could not be effectually done without a naval force on Lake Ontario, for which Sackett's Harbor was the most suitable station. This argument was sustained by the fact that this post was so important during the War of 1812, that the amount paid for transportation of military stores through the Black river country was believed to have exceeded two millions of dollars. Application was made for exact information on this subject to the Secretary of War, but it was not in the power of the department to furnish the information to the petitioners.

The Legislature had also received petitions from several other parts of the state for the establishment of canal routes, and in answer to them, passed an act (chapter 236), providing for the surveys of certain routes, which included one from the Erie canal, in the county of Herkimer, to the upper waters of Black river, thence on the most eligible route to the St. Lawrence river, at or near Ogdensburg, and another from the Erie canal, near the village of Rome in the county of Oneida, by the way of the Black river to Ogdensburg.

The canal commissioners, whose duty it was to cause surveys and estimates to be made under the provisions of this act, employed, for making these surveys, James Geddes, an engineer who had proved his ability during the building of the Erie. Mr. Geddes examined three routes, although only two were ordered, but in directing the survey of the route other than the one to Herkimer, the Legislators who passed the law, differed as to which way was meant, by Camden or by Boonville. The report showed that from the Erie canal opposite Herkimer, to the summit in Remsen, there was a rise of eight hundred and forty-one

feet, thence to Lake Ontario the fall was nine hundred and eighty-five feet, to which an additional fall of five feet from Gravelly Point to Ogdensburg made the whole lockage on this line eighteen hundred and thirty-one feet. As no calculation was made on more than one canal, the engineer submitted a more detailed account of the routes by Camden and by Boonville.

Of the route by Boonville, he reported that it had the advantage over the one to Herkimer in three particulars; the distance of canal would be seventeen miles less, the lockage one hundred and eighty feet less, and a large supply of water for the east end of the long level of the Erie canal could be taken from the Black river at a point where it was at all seasons a copious stream. The distance from Rome to the natural navigation below the High falls on the Black river, the engineer thought, would not exceed thirty-five miles, in which distance there would be seven hundred feet rise and four hundred and twenty-two feet fall to the foot of the falls, making together eleven hundred and twenty-two feet of lockage, which would require one hundred and forty eight-foot locks, just four locks to the mile. On this part of the route, it was stated, some deep cutting would be required, but after reaching the falls a fine piece of natural navigation along the Black river would be afforded to Carthage. This stream, which measured forty miles between the falls and Carthage, following the meanderings of the river, was then used chiefly by the forge owners at Carthage. Their wares were taken up the river, the return freight being ore, which was in many places loaded into the boat from the shore with wheel-barrows. The line of survey continued to Indian river, passing many ridges and valleys, yet requiring no deep cutting or heavy embankment, nor was the course very serpentine; the fall from Carthage to the river was estimated at two hundred and thirty-four feet. It was proposed to carry the canal on an aqueduct thirty-three feet above the river surface, afterwards passing through the village of Gouverneur, thence into the valley of Black-ash-flat creek, down which there was no obstruction to the Oswegatchie river, where the canal would enter at the head of a piece of river navigation which reached to the natural canal at Cooper's mills, from which there was a fall of sixty-eight feet to Ogdensburg. The whole distance of this route, from Rome to Ogdensburg,

including the forty miles of Black river, was one hundred and forty-six miles; deducting the course of the river, there remained one hundred and six miles of canal to be made, to this was to be added eight miles of feeder from a branch of the Black river to Boonville, where the summit level would be located. This made a total of one hundred and fourteen miles with a lockage of fifteen hundred and eighty-seven feet, making one hundred and ninety-eight eight-foot locks. The estimate for the cost was \$931,014, which embraced the following items: one hundred and fourteen miles of canal, at \$5,000 per mile, \$570,000; fifteen hundred and eighty-seven feet of lockage, at \$150 per foot, \$238,050; aqueducts, \$20,000; deep cutting at several points, \$30,000; dam, \$4,000; superintendence and engineering, \$68,964.

The route by way of Camden had much less lockage than the Boonville line. Beginning at the Fort Bull aqueduct, west of Rome, it followed the Fish creek valley for a distance and then passing through a slight cut reached the valley of Salmon river, the whole rise from the Erie canal being two hundred and twenty-four feet, and the fall to Salmon river, one hundred feet. Thence northward traversing the face of a country of remarkable regularity, the canal would pass over the Black river on an aqueduct into the valley of West creek and on to the valley of Indian river, down which it would be conducted to Black lake and thence to Ogdensburg. The distance by this route was about one hundred and fifty miles; adding three of feeder and deducting twenty-four miles of navigation in Black lake, there would be one hundred and twenty-nine miles of canal to be made, with a total lockage of six hundred and thirty-five feet. The estimated cost was \$655,630, consisting of one hundred and twenty-nine miles of canal at \$5,000 per mile, \$645,000; six hundred and thirty-five feet of lockage, at \$150 per foot, \$95,250; aqueducts and culverts, \$46,000; dam, \$6,000; superintendence and engineering, \$63,000. As timber abounded in large quantity on the two routes, estimates were given for wooden locks.

The canal committee of the Assembly, which had charge of the reports of the surveys that had been made pursuant to the act of 1825, concluded that these various surveys and examinations, among which were included those of the Black river routes, had not been so close and critical as the importance of the sub-

ject seemed to require, and in order to obtain a more particular examination and estimates, a bill was introduced for a resurvey, but without further procedure. A petition from the inhabitants of Lewis county desiring a canal from Rome to Ogdensburg brought no action.

The question of constructing a canal at the expense of the State between these points again came up before the Legislature of 1827, when many petitions were sent by the people of the counties previously mentioned, appealing for the canal, several petitioners favoring the Boonville route while others advocated the one by Camden. As it was not deemed advisable at that time to commence the construction of either until a more prosperous financial era should arrive, the matter was dropped.

In the following year, petitions from citizens residing in the counties of Lewis, Oneida, Jefferson and St. Lawrence were presented to the Legislature. These were different from those filed in previous years, this time a request being made for an act of incorporation to authorize certain individuals to construct a canal from Rome through Boonville to High falls on the Black river, and to improve and use this river for navigation from the falls to Carthage.

The committee in rendering their report before the Senate said that they could not "refrain from noticing one very important consideration in favor of the petitioners which if their views are right, presents strong claims to the legislature in favor of their application. . . .

"This [Black] river passes through a rich and fertile country, abounding in valuable timber and inexhaustible beds of bog and mountain ore, and in every respect well calculated to sustain a dense and flourishing population. Connect this river with the Erie canal, and it would be equal to an artificial canal of one hundred miles, costing one million of dollars, for the reason that the speed on it would be nearly double, and cost nothing except the one dam, to keep it in repair.

"If the above calculation be correct, it will be obvious, that by constructing thirty-five miles of canal (the distance from Rome to High falls), it will give the company a navigation equal to one hundred and thirty-five miles of ordinary canal navigation, worth \$1,400,000 for an expenditure less than \$400,000.

"But suppose the navigation of the Black river to be only equal to forty miles ordinary canal navigation, yet it would be worth to that company, computing it at the same rate of the other thirty-five miles, \$457,143; giving them seventy-five miles navigation, worth \$857,143 for the expenditure of less than \$400,000."¹

- It was thought, by the committee, that this would be a sufficient inducement for capitalists to invest their money in the stock of the company, and although canal charters had hitherto been unsuccessful, the application was favorably reported, as it was an undertaking for which individual enterprise and capital were sought for the use of beneficial objects of public improvement, without injury to the State or individuals, and because a canal such as was contemplated would add a "grand artery to the Erie canal, by which the superabundance of the north would be poured into the lap of our own commercial emporium."

The report was accompanied by the introduction of a bill incorporating the Black River Canal Company with a capitalization of \$400,000, divided into shares of one hundred dollars each. When the bill was introduced, one section authorized the Comptroller, after being satisfied that one-third of the capital stock of the corporation had been actually paid in and expended toward the construction of the canal, to subscribe to the capital stock, in behalf of the State, but there was determined opposition to this, and the section was eliminated. The bill as passed (chapter 87) authorized the company to make, construct and forever maintain a canal of suitable width and dimensions, to be determined by the president and directors of the company, over the route stated in the application of the petitioners, the time for the completion of the work being limited to three years.

The company was granted the power to acquire the land, real estate and water requisite for the canal, and certain provisions were made for the manner in which all questions were to be adjusted between the company and the owners of lands or property taken or damaged by reason of injury to water-power or inundation of lands caused by the erection of dams. The directors named in the bill, eight in number, or any three of them,

¹*Senate Journal*, 1828, p. 85.

were authorized as commissioners to open books for the purpose of receiving subscriptions to the capital stock.

After the act of incorporation had been passed, the commissioners of the company caused the route to be examined and an accurate estimate of the cost of the work to be made. For this they secured the services of Alfred Cruger, who reported to the company during that year the results of his examination. The operations in the field were so conducted that a general plan of the canal could be formed, without going into a minute and particular location of the works connected with it, which, it was supposed, could more properly be performed when the execution of the work was determined upon. The examinations were as full and perfect as the object required and as the time and money allotted would permit.

The main canal was divided into two sections, the southern embracing that portion from the southern terminus of the summit level at Boonville to the Erie canal, while the northern included the summit level, and the remaining distance to the High falls, a feeder forming a section by itself. The southern section, as proposed, followed very closely the course of Lansing kill to its junction with the Mohawk, thence running nearly parallel to the river till the village of Western was reached, where the river made a great deflection to the west, but was again intersected by the canal at a short distance above Barnard's mills, thence the canal followed the west bank of the Mohawk through Rome, to the Erie canal; the northern section began at the summit level and continued to Sugar river, which was to be crossed, the plans calling for a dam across that stream, and thence to High falls.

The length of canal that would be needed was given as thirty-three miles and seventy-eight chains with a navigable feeder of eleven miles and eight chains and a river navigation of forty miles. The whole lockage was reported to be one thousand and ninety feet. Of this, Mr. Cruger proposed to overcome one thousand and fifteen feet by inclined planes; the remainder, seventy-five feet, by locks. The dimensions of the canal were: twenty-five feet width on the bottom, four feet depth of water and thirty-two feet width of water-surface. The locks were to be seven and a half feet in width, and seventy-five feet in length of chamber in

the clear. These dimensions were sufficient for the passage of boats of twenty to twenty-three tons burden, which was as large a size as could conveniently be used on the inclined planes. It was believed by many engaged in transportation at that time, that boats of this size were more advantageous for navigating canals than those of larger size and would eventually supersede the larger boats. The cost of construction on Mr. Cruger's plan was estimated at \$437,738.25, which was made up of \$336,642.82 for the main canal, \$40,497.15 for a feeder from the Black river, it being proposed to make it navigable and of the same dimensions as the canal, \$4,168 for the improvement of the river by aid of wing dams or jetties, and \$56,430.28 for incidentals and engineering.

Mr. Cruger substituted inclined planes for ordinary locks, because he considered that under certain conditions they were more advantageous in overcoming great elevations. He had been employed on the Morris canal in New Jersey for two years, where he had seen the construction and operation of similar planes on that waterway, and he had the fullest confidence in them as a certain, cheap and expeditious mode of performing the task.

The Legislature of New Jersey, in 1829, had appointed a joint committee to examine the Morris canal and inclined planes. In their report, they said: "Nothing was more interesting and satisfactory than the operation of the inclined plane at Booneton, by which an elevation of eighty feet in height was surmounted by a plane of eight hundred feet in length. The boat in which the committee passed over the plane, was sixty feet in length, and eight and a half in width; had in her eighteen tons of stone and one hundred passengers, and was carried over in fourteen minutes, while at the same time an empty car descended; had the descending car contained a loaded boat, the descent would, no doubt, have been accomplished in a shorter time. The committee do not entertain the smallest doubt of the practicability of inclined planes thus applied, and of their superiority over locks in overcoming great elevations, as respects economy in time and a saving in water; their success will, we believe, exceed the most sanguine expectations of their advocates."²

²*Assembly Documents*, 1829, No. 146.

Knowing as nearly as possible the cost of the canal by the survey of Mr. Cruger, the commissioners of the company opened books for subscriptions to the stock, and used all the means in their power to carry the law into operation. This, however, they were unable to accomplish, the reason assigned for the failure being that individuals were unwilling to engage in a work, the whole cost of which they were to pay, while they were to receive only a part of the advantages to be derived from it. The persons interested in the work were willing to relinquish their charter, provided the Legislature would authorize the construction of the work at the State's expense, and they so stated in a petition to the Legislature in 1829. The memorial was accompanied by all the information received by the company from Mr. Cruger, together with the opinions of Benjamin Wright, well known as an able and experienced engineer, who, at the request of the company, had examined the plans and estimate of Mr. Cruger. Mr. Wright had been for thirty years intimately acquainted with every step of the ground traversed by Mr. Cruger, and was, therefore, in a position to decide as to the merits of the route. He expressed his perfect confidence in the amount estimated as being sufficient for the work; he endorsed the plan and recommended the adoption of inclined planes. The petitioners of that section of country felt that they were justified in calling upon the Legislature to share in its liberalities and that they had a right to ask to be placed upon an equality with other portions of the state, in having easy access to market. They argued that the superiority of inclined planes over locks was a cogent reason for constructing the canal, not only on account of the advantages to be derived in the first instance, but for the purpose of introducing into this state a method of canaling which could be applicable to other parts of the state, where it was desirable to construct canals but where the great elevations to be overcome presented almost insuperable objections.

The members of the Assembly committee having charge of the memorial attentively examined this subject, but were not prepared to recommend to the Legislature the immediate commencement of work, as they did not believe that as yet there had been obtained sufficient information on the subject of inclined planes, as a substitute for locks, to warrant their adoption without

further examination. Then, also, the canal, as surveyed by Mr. Cruger, was considerably smaller than the Erie, and the propriety of adopting a canal of these dimensions was doubted. It was deemed wise to submit these questions to the canal commissioners, the people seeking the improvement being content with this course, and the following resolutions were, therefore, sanctioned by both Houses:

"Resolved, . . . That the canal commissioners cause a route of a canal from Rome to the high falls of the Black River, to be surveyed, and estimates of the cost of constructing the same to be made; and also for improving the navigation of the river to Carthage, if they shall be of opinion that the dimensions of the canal as proposed by Mr. Cruger, will not answer, or that the surveys made by him are insufficient for them to report upon.

"Resolved, That the canal commissioners cause an examination to be made as to the comparative advantages of inclined planes and locks in overcoming great elevations, the difference of time in passing from one level to another, and of expense of constructing and maintaining them.

"Resolved, That the canal commissioners report on the above to the next legislature; also their opinion as to the propriety of adopting inclined planes on the proposed canal; also the probable revenue to be derived from the work, taking into consideration the additional tolls that will be received on the Erie canal; and such other information on the subject as they may obtain and deem worthy the attention of the legislature."

The commissioners failed to cause a survey to be made, and in 1830, the resolutions practically appeared verbatim in an act (chapter 114), which directed the work to be done and a report thereof to be rendered to the Legislature of 1831, an appropriation for the survey being included. As a result, in the latter year the report of a survey and estimate by Holmes Hutchinson, an engineer noted generally for his accuracy on such work, was submitted.

The project was, according to his report, considered perfectly feasible, although there were some parts of the work which would be expensive in construction. The principal items of extra ex-

^a*Assembly Journal*, 1829, p. 813.

pense were: the great amount of lockage, in proportion to the length of the canal; the narrow rocky valley, of about three miles, of the Lansing kill; the rock upon the summit level south of Boonville and the steep side-hill and uneven ground through which most of the feeder must be constructed.

Mr. Hutchinson reported the whole rise and fall from Rome to the Black river as one thousand and seventy-eight feet, and the plan he presented was to construct ten inclined planes similar to those built in 1829 upon the Morris canal in New Jersey, by Professor D. B. Douglass, to overcome six hundred and eighty-five feet; for the remainder of the elevation it was proposed to build thirty-nine wooden locks with stone breasts at the head and walls of stone upon the sides with pavements on the sides and bottom of the canal below the locks. The length of the canal, as surveyed by Mr. Hutchinson, was thirty-six miles, three more than the line surveyed by Mr. Cruger. To this was added about forty miles of river navigation to Carthage, which could be obtained at a small comparative expense without any additional lockage.

Mr. Hutchinson's survey began in the village of Rome and followed a course northerly on the west side of the Mohawk river, five miles, to Barnard's mills. Below the latter point there was a bank of shelly slate rock, and the canal would have to be formed by an embankment in the bed of the river, protected from the floods and ice by a pavement upon the outside of the tow-path. The canal would cross the Mohawk river in the sixth mile and continue on the east side for eight miles to the junction of the Lansing kill with the Mohawk and for the next three miles it would extend up the valley of the Lansing kill. The upper part of the valley presented some formidable obstructions to the making of a canal, as it was narrow, with not sufficient width for both the construction of the waterway and the passage of the stream, and the sides were mostly composed of shelly limestone and slate rock. In order to overcome the elevation here it was proposed to locate planes at the lower, centre and upper falls and then in the intermediate spaces to erect dams and locks, afterwards forming a towing-path upon the sides by excavating into the rock or by raising an embankment where the width of the ravine would allow of this mode. The summit level was

estimated at four and a half miles in length and would extend from a mile above the upper falls to the intersection of the canal with the feeder, two miles east of Boonville, the level necessitating deep excavations and heavy embankments. From the north end of the summit level to High falls, about eight and a half miles, the line was located in the valley and near the southwest side of the Black river, and although there was some limestone north of Sugar river and granite near the High falls, this part of the route was considered favorable, the soil being generally easy to excavate and having an even surface. It was planned to erect a dam at the largest branch of the Sugar river and cross the north branch by an aqueduct. The proposed feeder was nine miles long and would be taken from the Black river at Smith's mills, where, by raising the dam, a pond would be formed from which to draw water for the supply of the canal. This pond also would enable boats to communicate with both sides of the river. A guard-lock would be required near the pond to regulate the quantity of water to be admitted into the canal and to secure it against damage by floods. For the first four miles from Smith's mills and also on the last two miles, the feeder was intersected by a great number of ravines and ridges that would require the removal of a large quantity of earth.

Both the canal and the feeder were estimated to be constructed of the following dimensions: twenty feet width on the bottom, thirty-six feet width at the surface, with four feet depth of water; the banks to be raised in all cases three feet above the water-line of the canal; the berme to be eight feet wide on the top, and the towing-path twelve feet wide; and the slopes of the banks to have two feet horizontal base to one foot rise.

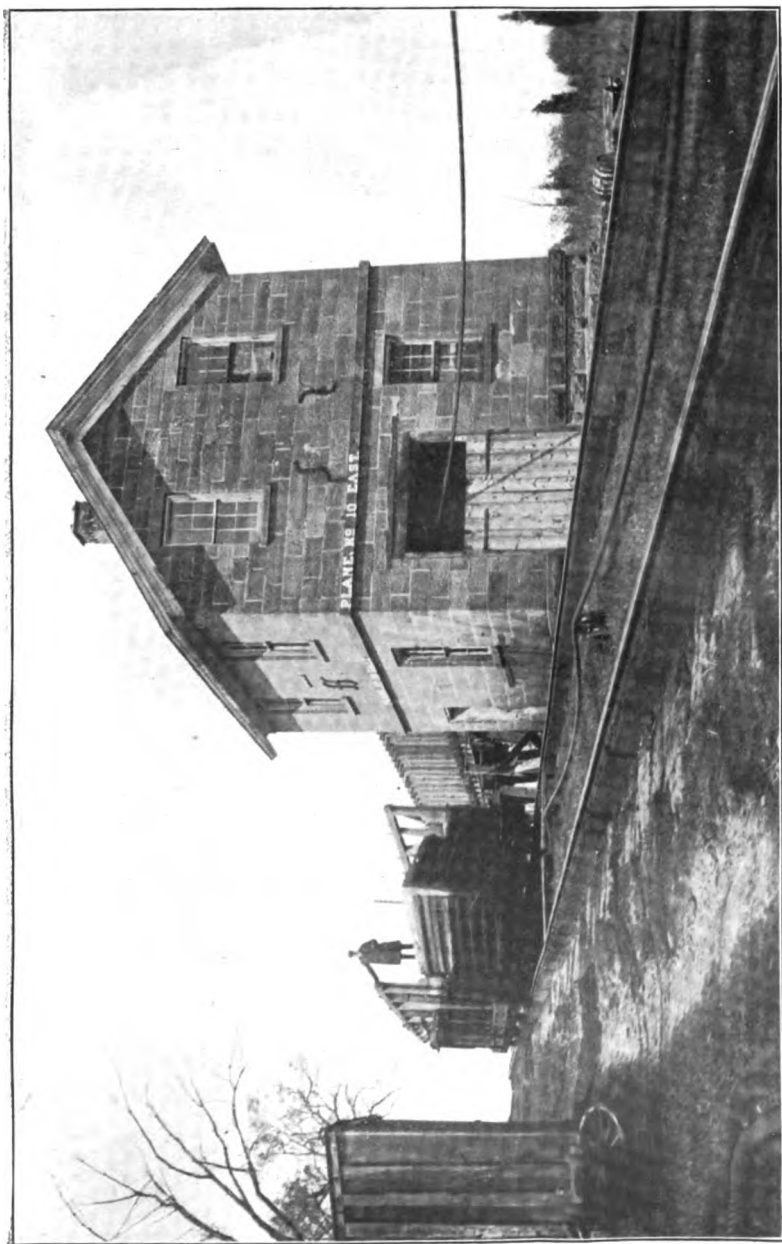
In regard to the Black river improvement the report of Mr. Hutchinson showed that the principal obstructions to navigation were the shoals which consisted of gravel and sand-bars, within the first three miles below the High falls. The river was wide, and from the shifting nature of the sand-bars, it was probable that the excavation of a channel through the loose sand would preserve sufficient depth of water only until the occurrence of a freshet or high water. Therefore, instead of such a plan it was proposed either to build a dam across the river below the shoals and construct a lock at one end of the

dam for the passage of boats from one level to the other, or, by a continuation of the canal from the High falls to connect with the river below the shoals. The engineer thought that either plan would overcome the difficulties in the navigation, but had a preference for the continuation of the canal. From these shoals to Carthage but little work would be required and this consisted of removing logs and stones, excavating three or four places through gravel-bars, and raising the dam at Carthage one foot.

As estimated by Mr. Hutchinson, the total cost of the work would be \$602,554, which comprised the following items: cost of canal, Rome to High falls, \$265,272; feeder, nine miles, \$67,580; 30 lift-locks of 10 feet each, \$62,400; 10 inclined planes of 70, 75, 95, 65, 45, 40, 60, 75, 70 and 90 feet, respectively, 685 feet, at \$220 per foot, \$150,700; engineering, etc., \$44,592; and for improving the Black river from High falls to Carthage, \$12,000.

This estimate was made upon the plan of using inclined planes for the greater, and locks for the smaller, descents. Mr. Hutchinson had become an advocate of this form of construction. He had personally examined the planes on the New Jersey route and with his report rendered a detailed account of the information he had obtained in relation to the manner of their construction and the general results of the experiment. Because of the great elevation to be overcome, and because he believed that the locations on this route were well adapted for inclined planes, and that boats could be passed by them in less time and with less expense of attendance than by locks, he favored the adoption of these planes upon the proposed canal. As the idea of using inclined planes was very seriously considered for a number of years before any plan was adopted and as upon this canal, alone, of the New York system was this scheme carefully considered, it is deemed fitting, simply as a matter of history, to quote rather fully from Mr. Hutchinson's report on this subject. He said:

"In the season of 1829, the Morris Canal Company had constructed four planes, viz: One at Bloomfield, one at Pompton, one at Montville, and one at Booneton. The two first have a lock at the head of the plane, to admit the boat to be floated directly on to the car, by filling the lock to the same height as the water in the upper level. The other two are called summit



CANAL-BOAT ON INCLINED PLANE, MORRIS CANAL, NEAR BOONTON, N. J.

This form of construction was seriously considered for adoption on the Black River canal. A full description, entitled "The Morris Canal and its Inclined Planes," by H. M. Wilson, may be found in the *Scientific American*, supplement, February 24, 1883.

planes, from the circumstance that a boat must pass over an elevation or summit, raised above the top water line of the canal, preparatory to its descent down the plane. Although there was but two kinds of planes, it may be observed, that neither two of those finished, were similar in all their details. Loaded boats were passed frequently on each of these planes with safety and dispatch; but as in all experiments of new machines, it required repeated trials and close observation to discover their defects, and to show wherein they might be improved.

"The Bloomfield plane is constructed as follows; and as this plane had the most perfect machinery, previous to those built under the superintendence of major Douglass, a comparison will show the improvements in the latter:

"The Bloomfield plane, with a lock at the head, connecting it with the upper level of the canal, is 740 feet in length; the descent of 70 feet in the lock, is one foot in 24 feet; in 600 feet of the plane, one foot in 12, and in 70 feet at the foot of the plane, nearly level. The entire descent, 54 feet. The place selected for this plane has a sloping surface, corresponding nearly with the descent of the plane. After graveling the plane, trenches were dug below the frost, and four walls of masonry, of about two and a half feet wide, by three feet above the surface of the ground, were laid the entire length of the plane. On these walls oak timbers were placed, and cast iron rails, of about four inches wide and two inches thick, having a convex upper surface, are secured by spikes with countersunk heads, to the top of the timbers.

"At the head of the plane there is a lock, at the end of the track upon each side, to enable the boat to float directly on to the cradle of the car. These locks have double gates, of the usual construction at the head, and a single gate, similar to the English safety gate, at the foot; and when open, lies at the bottom of the lock. These locks, and also the cradle, are made of a size just sufficient to receive the boats that usually navigate the canal.

"There is a car upon each track, supported by four cast iron wheels, seven feet in diameter, with a concave rim, made to conform to the upper surface of the rails; from this car, a cradle is suspended by iron rods, (the top of which is level with the

upper mitre sill,) on which the boat in its transit rests. An iron cable chain passes round a drum wheel above the lock, and one end is attached to each car; this chain is of sufficient length to extend from the car at the upper level in one of the locks, to the other car at the foot of the plane.

"The drum wheel, around which the chain revolves, is on a perpendicular shaft; this shaft is connected with a horizontal water wheel shaft, by spur and bevel wheels upon each side of the drum wheel.

"Motion is communicated to the whole machine, by water drawn from the upper level on to the water wheel; this water, as well as that from the lock, is discharged into the lower level, by a ditch for that purpose, by the side of the plane.

"The wheels of the car, and the railway or track of the plane, are elevated, to allow the axle of the car wheels to pass over the sides of the lock, and the wheels pass upon the outside, and do not interfere with the lower gate of the lock.

"The boat is introduced from the upper level, after filling the lock through the paddle gate, when the car is in the lock; this water raises the lower gate to its place, and the lock fills to a level with the water in the canal. The boat is then floated in, the upper gate shut, and by discharging the water from the lock, the lower gate falls by its own weight to its place, and the boat settles down upon the cradle, and is ready to move down the plane.

"The plane is so constructed, that a boat may pass up or down the plane singly, or a boat may pass each way at the same time. There is a friction-break on the rim of the water wheel to regulate the motion of the car, and also the common governor is applied for the same purpose; the governor is turned by a bevel wheel on the arms of the car wheel, and any accelerated motion of the car wheel would cause the balls or arms of the governor to fly out and disengage wedges that would fall before each wheel, and cause the stoppage of the car in any part of the plane."⁴

After this plane was constructed, the Morris Canal Company engaged Major D. B. Douglass to take charge and superintend the work on all the planes. He adopted the form known as the summit plane, but made such alterations and improvements in

⁴*Assembly Documents*, 1831, No. 229, pp. 17-19.

the machinery and cars as to obviate, to a great extent, the imperfections of the planes first built, including the one at Bloomfield. Those on the improved pattern were under construction at Newark while Mr. Hutchinson was on his tour of inspection and later, after they were brought into operation, he received information from Mr. Douglass concerning the test, which was highly satisfactory. Quoting Mr. Douglass' report, Mr. Hutchinson said:

" 'This [Newark] plane has a rise of 70 feet, in a length of 770; but the extreme length of the ways is 1040 feet. The ascent is uniform from the surface of the water in the lower level, to the height of that in the upper, at which point the summit curve commences, and the ways after rising one foot higher, descend into the water of the upper level.

" 'There are two pairs of tracks, on each of which is a car of very strong construction, supported by eight wheels, so arranged that the car may nevertheless pass over the summit, and from one declivity to another, with an equal bearing on the whole eight. The cars are connected with the machinery by cable chains, capable of bearing a strain of 15 tons, without alteration, and which have actually been proved to that degree. Upwards of 20 tons are required to break them. The strain put upon them by the operation of the plane is calculated never to exceed 6 tons. The moving power is a water wheel of 24 feet diameter, which is placed a short distance down the declivity of the plane. In the ordinary condition of the plane, one car stands in the upper level, the other in the lower, and a boat may pass in either direction, or two boats in opposite directions at the same time. The first part of the operation is to draw the car out of the upper level by a separate action of the water wheel; as soon as it has passed the summit and begins to descend, the main machinery goes into action, and then the ascending car begins to move. The motions of the two reciprocate, until the descending car reaches the bottom of the plane, at which time the ascending one goes over the summit, and descends into the upper level by its own gravity, independently of the machinery.' "

Quoting further in regard to the time of passing boats and their detention upon the inclined planes and also in regard to the cost of these planes, Mr. Hutchinson said:

^a*Assembly Documents*, 1831, No. 229, pp. 19-20.

“The *time* of passing is of course subject within certain limits to the discretion of the engineer, depending upon the power of the water wheel, and the train of the machinery. My water wheels, in the cases mentioned, were calculated with power sufficient to elevate the loaded cars at the rate of six feet *vertically* per minute. The average of their performance was nearly *seven*, but I do not think it desirable when moving *up under full loads*, that they should exceed that originally calculated; in the *descent* they will naturally move somewhat faster, at an *average* say of 12 minutes for a lift of 75 feet. To this we may add 2 minutes for getting the boat into the car and making it fast; making 14 minutes for the whole operation. The detention of the boat, however, does not equal this time, as it has advanced about 1100 feet in the operation, which is equal to full four minutes of its motion, at the ordinary rate of travelling. The difference, therefore, or *ten minutes*, is the nett detention for the lift mentioned, or $7\frac{1}{2}$ feet per minute. Comparing this detention by lockage, it will be seen that the plane of 75 feet can be passed in about the same time as a ten foot lock, and that a *planage* of 1500 feet is no more formidable in this respect than a lockage of 200.

“From the foregoing calculations, we perceive that the plane of 75 feet is occupied 14 minutes by a single operation, including 2 for getting into the car and making fast. At this rate the plane will easily make 4 operations per hour, (in fact it did five with ease in our experiments,) and afford planage to four boats in each direction. Whether the boats *present* themselves regularly or not, is not material, as the question of capacity is only interesting on the supposition of a *crowded* navigation; and it is presumed that few cases can occur in which it would be necessary to pass more than four boats per hour in one direction, or more than eight in both. Taking an average case, we should pass 6 boats per hour in both directions, which is about equal to the performance of a lock. Independently of this comparison, however, we can be quite sure that an inclined plane of 75 feet lift, supposing an average lading of 20 tons would pass 80 tons per hour, or 1,600 tons in twenty hours per diem, in each direction, which is at least one half greater than the whole commerce of the Erie canal, at the busiest season of the year. Cargoes of 25 tons would make 100 tons per hour in each direction, or 2,000 in 20 hours per day. . . .

“The expense of inclined planes. *This*, estimated by the foot-lift, will vary considerably for planes of different elevations. The water-wheel machinery and cars being the same for all elevations. Taking that of 75 feet, however, as an average, and the tonnage the same as that upon the Morris canal [25 tons], the cost will not materially vary from \$210 per foot-lift; a plane of 50 feet might rise as high as 250 dollars; lower lift, if no variation was made in the machinery, would rise still higher: but I am inclined to believe that an arrangement of single cars and more simple machinery could be adopted with advantage, for planes of less than 45 feet lift, which would keep the expense within the limits of 250 dollars, even for planes of no more than 25 feet lift.’”^a

Appended to Mr. Hutchinson's report was a statement of the canal commissioners relative to the subject. They did not feel authorized to recommend the adoption of structures similar to those in use on the Morris canal, until inclined planes should have been more fully tested by time and experience. As the commissioners were unable to acquire the necessary information to enable them to furnish an estimate of the probable amount of revenue which would accrue from the canal, they refrained from saying anything on the subject. This action had the effect of delaying legislative measures on the question of constructing the canal.

However, the Legislature of 1831 was furnished with an estimate of revenue by residents of the Black river country. On November 22, 1830, there had been held in Lowville, Lewis county, a meeting of canal delegates from the various towns situated on the canal route, at which was passed a resolution appointing a committee of four to correspond with the canal commissioners on the subject of revenue. The committee immediately addressed a circular to the several town committees, requesting them to furnish a statement of the actual amount of tonnage in their respective towns during the preceding year. Returns from fifteen towns showed an aggregate of 30,766 tons; nothing was heard from nineteen towns, but estimating these proportionately with the others, they were expected to yield a tonnage of 20,000 tons. This made a total of 50,766, from which the com-

^a*Assembly Documents*, 1831, No. 229, pp. 20-21.

mittee was sanguine that tolls amounting to \$49,602.32 would be collected annually, with bright prospects of increasing ten per cent for ten years. The estimates were made exclusive of the immense quantities of wood and lime which that section of the country afforded.

Besides all this information that had been presented to the Legislature in this year, 1831, there came to that body a communication which expressed forcible arguments for improving the transportation facilities of the territory. This was a petition from Oneida, Lewis, Jefferson and St. Lawrence counties, whose inhabitants desired what all former petitioners had clamored for—the connection of the Black river with the Erie canal. It was urged that the country, through which the proposed canal extended, was fertile and capable of being very productive; that the tide of immigration at one time had set strongly in that direction; that the territory was increasing rapidly in population and wealth, with prospects of rivaling the most promising portions of the state, when the construction of the Erie canal had destroyed these sources of its prosperity. Immigration was diverted into different channels; more distant citizens could transport their products to market with such facility as to compete with the inhabitants of the Black river section, and destroy the advantage of their proximity to market, which they had formerly enjoyed, and for which they had paid in the advanced cost of their lands. In consequence, the petitioners asserted, their property had depreciated in value, while they were doomed to witness other more favored parts of the state growing rapidly and increasing in prosperity, happiness and wealth by the very means which had depressed and arrested their own progress. The Black River canal was desired for the purpose of counteracting these disastrous effects, and enriching that portion of the state.

However, the feasibility of the project, its cost and the probable revenue to be derived from it were still, in the estimation of many, necessary matters of inquiry. The great elevation which had to be overcome seemed to be a stumbling-block of the whole project and appeared the more objectionable when compared with that of other State canals. In comparing the length of several canals and their aggregate rise and fall, it

was shown that the Black River canal, not thirty-six miles long, would have to overcome a greater elevation than the combined Erie, Champlain, Oswego and Cayuga and Seneca canals, with their total of one thousand and seventy-four feet of lockage and four hundred and eighty-three miles of waterway. As the Legislature did not deem it proper to proceed with the work, no immediate action rewarded the endeavors of the projectors.

Again in 1832, another petition was before the Legislature, but asking for an act to incorporate the Black River Company, which proposed to connect, by railroad or canal, the Black river with the Erie canal, the act of 1828, incorporating the Black River Canal Company, having expired. The enactment of chapter 174 soon followed, being an act to incorporate the company with a capital stock not to exceed \$900,000, which was to be divided into shares of \$50 each. The company was authorized to construct one or all of six sections, provided that one or more of them should be completed within three years from the passage of the act, in which event a further term of ten years would be allowed the company for perfecting the whole route or any of the sections. The following were the sections:

1. A section from the Erie canal to the High falls of the Black river.
2. A section from the first through the county of Lewis and the village of Watertown to Sackett's Harbor.
3. A section from Carthage to Sackett's Harbor.
4. A section from either the second or third to the village of Cape Vincent.
5. A section from the village of Carthage to the navigable waters leading to the village of Ogdensburg.
6. A section for the improvement of the Black river from the High falls to Carthage and for its navigation by steamboats.

The law also authorized the company to transport persons and property over the routes for a term of fifty years, but in case of failure to complete one of the sections within three years, the act was to become null and void. The usual powers were allowed for obtaining the right of way where, at the option of the company, it was necessary to locate any of the routes.

Two years later, in 1834, after no attempt had been made by the company to accomplish the work embodied in the act of

1832, the attention of the Legislature was again called to the subject, the people interested being of the opinion that the work, if constructed at all, must be made and controlled by the State. The importunities of the people resulted in the Legislature passing an act (chapter 139), directing the canal commissioners to "cause a route of a canal from the navigable waters on Black river, below the High falls, in the town of Turin, in the county of Lewis, to the Erie canal, to be surveyed, in the shortest practicable direction with regard to the cost of construction and public utility; and a navigable feeder from Black river to the summit level of said canal, and estimates of the cost of constructing said canal and feeder to be made; and also for improving the navigation of Black river from the High falls to the village of Carthage, if they shall be of the opinion that the surveys and estimates heretofore made by Messrs. Cruger and Hutchinson have not been sufficiently minute and accurate to arrive at a correct estimate of the cost of constructing said canal and feeder, and improving the navigation of said river." The law provided for the resurvey of so much of the route surveyed by Mr. Cruger and Mr. Hutchinson as the commissioners should deem expedient to form a correct estimate of the cost; for a further examination to be made in relation to the inclined plane; and also for a report on the probable revenue that would be derived from the construction of the canal.

On May 22 Timothy B. Jervis was appointed by the commissioners to make the examinations, surveys and estimates. He was also directed to furnish an estimate of the cost of as many planes, if any, as in his opinion could be advantageously substituted for the ordinary lift-lock, and report his opinion of the utility of inclined planes. The service was performed and the engineer's report was submitted to the Legislature of 1835.

The line upon which the survey was made commenced at nearly the same point on the Erie canal and pursued in general the line of the former surveys. The lateral distance from the former lines was nowhere more than about a quarter of a mile. At Lansing kill there was a material deviation in method. Former plans had provided for overcoming the rapid descent from the narrows to the kill, one hundred and seventy feet, by inclined

planes, and a slack-water navigation by dams and locks, but Mr. Jervis proposed to overcome the elevation by seventeen locks of ten feet lift each, located at the following distances from each other: 33, 15, 24, 15, 12, 15, 12, 12, 15, 12, 9, 15, 12, 12, 9, 12 and 27 chains. As in the former surveys it was proposed to take the feeder to the canal from the Black river at Smith's, about nine miles above the village of Boonville,

In reference to the improvement of the Black river between the High falls and Carthage, Mr. Jervis said: "the obstructions to navigation between those points consist mostly of sand bars which occur at different places for the first twenty miles below the falls." The plan advocated to remove these obstructions was "by the excavation of the channel so as to obtain a sufficient depth of water, and by guarding the channel by constructing wing-dams to concentrate the current, so that its deposits would be carried through and lodged in deep water below the bars." The expense of improving the river was estimated at \$20,840.

For the purpose of obtaining information in regard to the utility of planes, and the expense of their construction and maintenance, Mr. Jervis visited the Morris canal, and in his report stated:

"Experience has not, in my opinion, fully established the propriety of adopting this mode of overcoming elevations on canals, of the size of the one proposed. Although there seems to be no mechanical difficulty in the construction or operation of inclined planes, yet as the machinery is more complicated, it necessarily follows that more contingency will attend their use than that of locks. In regard to the experiment thus far, it may be observed, that those most acquainted with the planes on the Morris canal, while they speak with decided confidence of their utility, are not satisfied with any plan now in operation. It is therefore evident they deem improvements to be essential to their complete success. Whether such improvements will materially affect the expense, can only be determined by experiment."

The engineer recommended the adoption of two inclined planes, not because it was indispensably necessary, but for the reason

that it would save about thirty thousand dollars, and give to the public the advantage of an experiment, but in the event of the planes proving unsuccessful, it would result in a loss, according to the estimate, of \$73,871.20, besides the interruption to navigation. His plans provided for two inclined planes, ten combinations of two locks each, fifteen combinations of three locks each and seventy-four single locks, but if the planes should not be adopted eleven additional single locks would be necessary.

The survey gave the total rise and fall at 1,083½ feet; the length of the canal and feeder at 46-76/80 miles; the river at forty miles; and the aggregate cost of the canal, feeder and river improvement, on the plan of adopting two planes, combined locks of stone masonry and single locks with wooden chambers, at \$907,802.72; if this plan was changed so as to construct all the locks of stone, the cost would be \$1,019,221.72; with the inclined planes eliminated, the combined locks made of stone, and the single locks with wooden chambers, the cost would be \$940,540.20, but with all the locks made of stone, \$1,068,437.20. The survey and estimates were based upon a canal of twenty-six feet width at bottom, forty feet at water-line and four feet depth of water, calculated for boats of forty tons burden; the feeder to have the same dimensions, except the bottom, which was to have a width of twenty feet.

To the report of Mr. Jervis the canal commissioners appended a statement concerning the probable revenue, comparing the Black river district with the districts dependent on the Crooked Lake and the Chemung canals, as the latter were thought to exceed in extent and productiveness the one in question. The combined tolls for 1834 on both canals were \$1,850.03 for forty-seven miles. According to these rates, the tolls for the first year of operation on the Black River canal would be \$8,976.53, provided the district, through which it passed, should prove to be as extensive and productive as the districts held in comparison. The commissioners were unable to account for more than this amount, as they were not provided with the details of the actual business and transportation of the Black river country. In summing up the question as to whether the canal should be constructed, they were of the opinion that the last survey, as well as former ones, was insufficient and that a further survey should be made.

About a month after the engineer's report had been submitted to the Legislature, several petitions were presented to the Assembly, relative to constructing the canal by the State. The petitions were accompanied by a printed pamphlet, which was published at the instigation of a committee chosen at a meeting held at Collinsville, Lewis county, to ascertain the probable amount of tonnage on the proposed canal. The result of the committee's labors was embraced in the pamphlet, which showed that the canal would yield a revenue of \$74,206 per annum. Believing in the accuracy of this estimate, the Assembly committee on canals and internal improvements introduced a bill for the construction of the canal, but, when it came up for final passage, it was defeated by a vote of sixty-seven to thirty-seven.

In 1836 petitions sent to the Senate apparently bore fruitful results, for in that year a law was passed (chapter 157), authorizing the construction of the canal, section one reading thus: "The canal commissioners shall proceed, with all reasonable diligence, to construct and complete a navigable canal, from or near the foot of the High falls in the Black river, in the county of Lewis, by the most advantageous route, to the Erie canal at Rome; and also a navigable feeder from the Black river to the summit level near the village of Boonville." The width and depth of the canal and feeder were to be determined by the commissioners, as was also the method of overcoming elevations, whether by means of inclined planes or by locks constructed of wood, stone, or stone with wooden chambers or by means of both locks and inclined planes. The act specified that the feeder and canal should be so constructed as to pass as large a quantity of water to the Erie canal as could reasonably be spared from the Black river, and from the northerly portion of the Black River canal. The river from the High falls to Carthage was to be made navigable for steamboats drawing four feet of water. The law also contained a provision for supplying funds, and the commissioners of the canal fund were empowered to borrow, on the credit of the State, a sum not to exceed \$800,000, or to borrow from time to time such sum or sums as should be required for the work. Section ten stated that the waterway should be known by the name of "The Black River Canal and Erie Canal Feeder."

Although the Senate had before it a petition for the canal from the inhabitants of the interested counties, the real reason for authorizing its construction was the same as that which has kept it in existence ever since—the need of a greatly increased water-supply for the Erie canal, the enlargement of which had been ordered in 1835. The forests on the head waters of the Black river were looked to, then, as now, for a large share of the water that was necessary to supply the Rome level. That a large supply of water was wanted beyond that which was then furnished on that level was officially announced to the Legislature by the report of the canal board. Another factor which operated in favor of the canal was the fact that the State would be benefited to a considerable extent by its construction, by reason of there being large tracts of public lands, the value of which would be enhanced by the accomplishment of the contemplated project.

Since this subject was before the Legislature of 1835, the State had had one more year's experience under the canal system, and the result was not only gratifying, but a most triumphant vindication of the wisdom of its projectors, and of the successful management on the part of those who had it in charge. The increase of business had been such that, notwithstanding a reduction in the rates of toll, the revenue continued to increase and it was anticipated that the business of the system would show a decided gain with the Black River canal in operation. The canal and river improvement would afford a cheap and easy access to a vast timber and lumber region and the City of New York and in fact all the cities and villages on the route of the Erie canal, as well as the flourishing places on the Hudson river, where lumber was scarce, seemed to have a direct interest in the contemplated work. During the time that the Senate committee had the subject under consideration, the Assembly had tabled several petitions, but it concurred in the measure shortly after it was delivered to that House.

In 1836 the canal commissioners detailed Portous R. Root, who had been assigned to take charge as principal engineer of the construction of the canal, to visit the Morris canal in New Jersey in company with two other engineers, Messrs. Hutchinson and

Mills, and to make a personal examination of the inclined planes. They found the planes in successful operation and exhibiting a state of improvement in that peculiar mode of transportation, but no certain information could be obtained as to their cost of construction. One of them, which overcame an elevation of fifty-four feet, was estimated to have cost about \$17,000, being little more than \$300 per foot of lift. The width of the Morris canal was considerably less than that of the lateral canals in this state; its depth was four feet; its boats were of eight and a half feet beam, and their ordinary weight, including boat and cargo, about thirty tons, being about one-half the tonnage of boats upon the lateral canals of New York. This was the maximum weight of boat and cargo which was deemed safe to be transported upon the planes, both in respect to the strength of the machinery, and the safety of the boat while sustaining its burden upon the plane. The freight of the Morris canal was principally coal, a heavy compact article, well suited to the use of inclined planes, while a considerable portion of the freight of the Black River canal would, for many years, consist of lumber, a cumbersome article, which was considered least suited to the planes.

From their investigations the engineers were of the opinion that inclined planes might be advantageously adopted upon independent canals of limited business, where tonnage was uniform, and mostly of heavy, compact articles, and where great elevations were to be overcome in rapid ascents, for by this means boats of small dimensions and light cargoes could be elevated and depressed with much greater rapidity, and with less expense in the construction of the work, than by the ordinary mode of lift-locks.

From the considerations above presented, the canal commissioners came to the conclusion that inclined planes were not desirable upon the Black River canal, and they determined to adopt stone locks instead of planes and fixed the dimensions of the existing lateral canals forty, twenty-six and four feet, as proposed in the report of Mr. Jervis, as the size for this canal. The records show that the canal was built with dimensions of forty-two, twenty-six and four feet, while those of the feeder were forty-six, thirty and four feet.

Preparatory to a location of the line for the canal, Mr. Root, on September 7, 1836, commenced the survey, beginning at the line proposed for the improvement of the Erie canal at Rome. The reports and maps of previous surveys afforded the engineer much useful information and enabled him to direct his surveys more advantageously than he could otherwise have done. Only a small portion of the line was finished that year, so that a report of the entire survey was not made till the next season.

Meantime the contemplated movement of diverting the waters of Black river to supply the Black River canal and Erie canal feeder aroused opposition from owners of the surplus water of the river at the Fish Island dam in the village of Dexter, located near the mouth of the river in the county of Jefferson. They presented a memorial to the Legislature of 1837, stating some of the grounds of their asserted rights. They pointed out the fact that the Legislature, by act of March 8, 1811, vested the surplus water of Black river, at the lower rapids, in the Black River Navigation Company, and that they were the owners of that water, together with the land on both sides of the river at that point; they claimed the right to use the water for their own advantage, as independently of foreign interference, as they did their land or any other property and requested the State to pause and consider before diverting the waters; but here the matter rested.

The only step taken by the Legislature of 1837 in regard to the canal was the enactment of a law (chapter 360), making it lawful for any bank in New York State to subscribe to any of the loans which the commissioners of the canal fund were authorized to make on account of the Black River canal.

In the following year, the report of Mr. Root was submitted to the canal commissioners. He reported that the canal from Rome to the point of intersection with the river below the High falls was thirty-four miles and seventy-four chains in length; the river from this point to Carthage was forty-two miles and forty chains, making the distance from Rome to Carthage, by the canal and river, according to Mr. Root, seventy-seven miles and thirty-four chains; the feeder from Black river was ten miles and two chains in length. The summit level was elevated above the Erie canal at Rome six hundred and ninety-three feet

and would be overcome by seventy locks, as follows: three combinations of three locks each with lifts of ten feet; one combination of four locks with ten feet lift; two single locks of eight feet; three single locks of nine feet and fifty-two single locks of ten feet lift. The descent from the summit to the river, where the canal was to intersect, was three hundred and eighty-seven and a half feet and thirty-eight locks would be necessary to overcome this elevation; of these, there was one combination of three locks; four combinations of four locks each with lifts of ten feet; one combination of six locks with lifts of twelve feet; eight single locks of ten feet; four single locks of nine feet and one of nine and a half feet. The total number of locks would be one hundred and eight, combining an elevation and depression of $1,080\frac{1}{2}$ feet.

The first fourteen miles of the canal, from the junction with the new line for the Erie canal enlargement, near the eastern bounds of Rome, continued in the valley of the Mohawk, crossing to the eastern side of that river, about five miles north of Rome, and passed over ground favorable for a canal, the face of the country over which the line was surveyed presenting easy undulations, with gently sloping or entirely level ground; a line was also surveyed, commencing about five miles west of Rome and intersecting the line of the other survey west of the Lansing kill. In their final determination the commissioners concluded that public interest required the adoption of the eastern route. Near the termination of this section of fourteen miles the line was so located that a feeder could be taken from the Lansing kill at a moderate expense. A feeder at this point was thought desirable, in order to avoid the inconvenience of passing a large body of water around the flight of locks and through the short pound-reaches which occurred in the valley of the Lansing kill. From the termination of the fourteen miles the line passed up the valley of the kill to the south end of the summit level, which would be two miles and twenty-two chains in length. From this point the route descended the northern declivity of the summit ridge, passed over Mill creek and the Sugar river by aqueducts and thence through the valley of the Black river to the High falls.

In regard to the feeder, the engineer stated that to obtain its necessary elevation, the water in the river would have to be raised twelve feet and, to do this, it was proposed to construct a dam, twenty feet high and two hundred feet long across the river, a short distance above the mill-dam at Smith's mills (Forestport).

The report suggested two methods of making the Black river navigable for steamboats drawing four feet of water, as required by the act of 1836; one by erecting at several points across the river dams of sufficient height to raise the water to the depth of five feet, with a lock at each dam to transfer boats from one level to the other; the other, by jetties or wing-dams and parallel piers, so as to contract and govern the stream, trusting to the force of the water to keep the channel clear, when once it was made clear by this force, or by excavation, if necessary.

The cost of the entire work, as estimated by Mr. Root, was \$2,431,699.29, with the Black river improved by locks and dams; or if by the erection of jetties and parallel piers, the estimate was placed at \$2,421,004.77.

It will be remembered that, in determining which route was the more feasible, the eastern or the western at Rome, the commissioners chose the eastern route. The western course passed through the village of Delta, and after the officials had decided adversely to this route, the inhabitants residing thereabouts asked the Legislature to construct a lateral canal or side-cut from Delta, situated in Oneida county, to the Black River canal, a distance of about one mile and a quarter. It was alleged that the proposed location of the canal deprived a large portion of their district from all participation in the benefits to be derived from that great work of public improvement, because there was not upon the line of the canal, as then located, any convenient point of access or place of shipment within a reasonable distance of the village of Delta; the section of country thus shut out from the full benefit of the canal, it was asserted, was one of large and constantly increasing business, the amount of tonnage actually transported to and from the Erie canal in 1837, being not less than 2,750 tons, all of which was subjected to a land transportation of from six to eighteen miles. Much of this land carriage would be saved by the construction of the desired side-

cut. The petitioners had had a survey and estimate made and the cost of the undertaking was computed to be about \$10,000. They asserted that the water to supply the side-cut could be taken from the Mohawk at Delta, and that the side-cut would serve as an additional feeder to the Black River canal, if required. A bill was introduced authorizing the work, but as it failed to make any headway, the inhabitants of the town of Lee, Oneida county, assembled in mass meeting and afterwards forwarded the proceedings which urged the passage of the bill. But it subsequently died in the committee of the whole in the Assembly.

The first work in the construction of the Black River canal was put under contract on November 11, 1837, at \$468,865.71, the prices on the several pieces of work being deemed reasonable. On May 24, 1838, there was offered at a public letting at Boonville, all the work on the line extending from the mouth of Lansing kill to Boonville, including six locks, the propositions for which had been declined at the previous letting; and also the work on the Black River feeder, ten miles long, with all its mechanical structures except the guard-lock and dam at its head. A satisfactory competition was aroused among contractors and all the excavation and embankment was taken at fair prices. Propositions for the mechanical work also, with the exception of some of the locks, were accepted. The locks offered were numerous and many of them were located in a rough, woody country. The quarries near the line of the canal had not been worked, and although partially opened, fears were entertained by contractors that stone of suitable quality and in sufficient quantities could not be found within a reasonable distance. Propositions for many of the locks were for prices so high that it was deemed most prudent, in some instances, to decline their acceptance and to defer the letting of a portion of the locks advertised until the quarries could be further opened, in the belief that the search that would be made by those whose bids had been accepted, together with some further effort for that purpose at the expense of the State, would in a great measure dissipate the fears entertained on that subject.

Contracts were entered into, in most instances, in pursuance of the bids accepted and the work was generally commenced with

spirit. The contractors for locks set themselves to opening and examining quarries and making preparations generally for the performance of their contracts. In the same year there were let at Boonville on September 5, contracts for work from Boonville nearly to the High falls, including the locks offered at the May letting, and not taken, and also including eight locks contracted for at the November letting, in 1837, but afterwards abandoned by the contractors. At this letting a large attendance of contractors was secured and bids for a very large amount of work at reasonable prices were received and accepted. The locks offered, however, were numerous, being no less than sixty-six in number, and, although an increased confidence had been inspired in the facilities afforded for obtaining stone, still the prices proposed were not such in all cases as to justify an acceptance. However, propositions for forty-seven of the sixty-six locks were accepted and in most cases contracts were entered into and the work commenced. During this season a commencement was made upon the improvement of the Black river.

While the work of construction was thus progressing, the question of extending the canal in various directions was being agitated. In 1838 sundry petitions from inhabitants of Jefferson and St. Lawrence counties interested the legislators in the extension of the Black River canal from Carthage to either Sackett's Harbor on Lake Ontario or Ogdensburg. It was stated that the traffic of the canal would be increased more than two hundred per cent by the continuation of this work. There was being sawed, annually, in the county of Jefferson and near where the extension was desired, ten million feet of lumber which would be enhanced in value \$3.50 per thousand; the county of Jefferson was one of the most productive in the manufactures and in agriculture of any in the state; there were numerous manufactories of cottons and woollens, forges, furnaces, nails, glass and machinery; the products of the dairy were large and as a grazing and wheat-growing county it was surpassed by but few counties in the state.

In addition it was argued that, by the construction of this short link in the chain of communications, more than six hundred miles of canal and inland boat-navigation would thereby become connected with the canals of this state, forming a continuous navi-

gation, without the necessity of a single transshipment, from the Grand or Ottawa river, through the Rideau canal, and from the head of Lake Huron through a chain of small lakes and rivers, which were being improved by the Colonial Government, the Bay of Quinte, the River St. Lawrence, and the Black River canal, to the City of New York. The petitioners insisted that, from a military point of view, the work appeared even more necessary, as the British Government had within a few years constructed, at great expense, the Rideau canal, which gave them, through the interior of Canada, a safe approach to the very border of Jefferson county; and a short extension, of from twenty-six to thirty-four miles through this county, would enable our countrymen to maintain their position in time of war, at a great saving of expense in the transportation of armaments and stores, and would greatly promote the interests of the State by an interchange of commerce with the interior of Canada in times of peace.

The question was not acted upon at that session, and, therefore, petitions of similar import were forwarded to the Legislature in 1839, when an act (chapter 321) provided for a survey of a canal route to continue the Black River canal from Carthage to Lake Ontario and the St. Lawrence river, in the county of Jefferson, and also from Carthage to Ogdensburg. The result of the survey was to be reported to the Legislature in 1840, together with the estimated cost of the extension, the probable amount of revenue to be received, and an estimate as to what extent the revenue on the Black River canal would be increased, in the event of the extension being constructed.

Edward H. Brodhead, a civil engineer, was appointed to make the survey, two other engineers being assigned to assist him in the work. The surveys and estimates were made for a canal of the following dimensions: the depth of water to be four feet, width of bottom twenty-six feet, and the surface of the water forty-two feet, the banks to be three feet above the water-line, with a slope of two feet horizontal base to one foot rise, both in front and rear, the width of the towing-path to be twelve feet on top, and the berme seven feet. Several routes were surveyed, the names of the routes, the number of locks, their length, the amount of lockage, and estimates of cost being as follows:

Carthage to Sackett's Harbor—Length, $31\frac{1}{4}$ miles; 50 locks, 480 feet lockage, total cost with stone locks, \$1,444,614.28, with composite locks, \$1,230,629.28, with wooden locks, \$1,040,027.28.

Carthage to Dexter—Length, $27\frac{3}{4}$ miles; 50 locks, 480 feet lockage, total cost with stone locks, \$1,394,036.32, with composite locks, \$1,180,176.02, with wooden locks, \$988,943.02.

Carthage to French creek—Length, $34\frac{1}{2}$ miles; 48 locks, 480 feet lockage, total cost with stone locks, \$1,327,874.67, with composite locks, \$1,086,585.67, with wooden locks, \$894,108.67.

Carthage to Ogdensburg—via Oxbow and Oswegatchie river—Length, $77\frac{1}{8}$ miles; 54 locks, 527 feet lockage, total cost with stone locks, \$1,681,150.41, with composite locks, \$1,417,410.41, with wooden locks, \$1,179,910.41. Via Gouverneur—Length, $72\frac{3}{8}$ miles; 64 locks, 621 feet lockage, total cost with stone locks, \$2,515,199.87, with composite locks, \$2,217,566.87, with wooden locks, \$1,948,150.87. Via Little Bow Landing and Oswegatchie river—Length, $72\frac{3}{8}$ miles; 53 locks, 517 feet lockage, total cost with stone locks, \$1,954,274.48, with composite locks, \$1,688,433.48, with wooden locks, \$1,447,230.48.

Pursuant to the act of 1839 the canal commissioners transmitted the report of the survey to the Legislature in 1840, but they did not give the information regarding the revenue to be derived as they were not able, at that time, adequately to estimate any amount. The introduction of a bill to build the extension followed, but upon final passage the measure was defeated by a vote of sixty-three to twenty-six. Later, the Assembly passed the following resolution:

“Resolved, That the Canal Commissioners report to the next Legislature, an estimate of the expenses of constructing the extension of the Black River canal, from Carthage, to some point or points on Lake Ontario or the River St. Lawrence; the probable amount of revenue to be derived from the same when in full operation, and the probable amount of increase of revenue to that part of the Black River canal already authorized to be constructed, and such other matters as shall have a bearing on the expediency of extending the Black River canal.”^a

The commissioners reported at the time designated and stated that any estimate would necessarily be conjectural; that they

^a*Assembly Journal*, 1840, p. 1510.

did not feel authorized to submit any estimate which might be taken as a basis for legislation, and referred the legislators to the report of Mr. Brodhead for the estimated cost. From the best information which the commissioners were able to obtain, an opinion was expressed that the total revenue which would accrue to the State from this extension would not, for a number of years at least, defray the cost of repairs and superintendence.

In this year several more petitions were received, imploring the State to proceed with the undertaking, and another bill was before the Assembly, but it never came from the committee on canals. A large number of petitions appeared before the Legislatures of the next few years.

But to return to the construction work on the Black River canal. In 1839 the work, though not all under contract, was considered as being in a successful state of progress. During the year the work of opening quarries and procuring materials had been actively prosecuted, and it was gradually discovered that stone of a superior quality and in great abundance existed within convenient distances from all the locks on the southern extremity. In many instances so convenient were the quarries that the stone for the lock walls were either quarried from the lock-pits or dragged on stone-boats from quarries within a few rods. This condition made it favorable for putting under contract the remainder of the work, as great anxiety was then manifested by contractors to obtain contracts for locks, at prices much below those proposed at the former lettings. But as doubts existed as to whether funds could be realized for the balance of the appropriation, the funds on hand being barely sufficient to carry forward the work then under contract to the close of the Legislature of 1840, the letting was, therefore, necessarily deferred.

Late in the autumn of 1839, however, the commissioners of the canal fund succeeded in obtaining funds for a part of the balance of the appropriation, and a portion of the remaining work was advertised to be let at Rome, on December 19. The bids for the work, located on the south part of the line, were numerous and the prices were much lower than had been proposed at the two previous lettings. In 1840 the Legislature passed an act (chapter 161) appropriating \$250,000 toward the

work, and in 1841 another appropriation amounting to \$300,000 was made under act (chapter 194).

Up to the first of January, 1841, the portion under contract amounted to \$1,680,079.73, of which, work had been done and paid for to the amount of \$1,197,348.65. Certain locations on the line had not yet been put under contract, but the letting was further delayed because section six of this act (chapter 194) directed that no work should be let during the year, except such as was necessary to render available the work then in progress.

At this time the deficiency of water on the Rome level made it necessary to render the feeder available as soon as possible and, to effect this result, surveys and estimates were made of that part of the work not under contract, which was essential for this purpose. This consisted of a dam across the Black river, a guard-lock and sluice for admitting the waters and a section of the feeder connecting with these structures. The work was let on August 31, to be completed on September 15, 1842. The extraordinary and long continued dry weather of the year afforded a very favorable opportunity for testing the value of the Black river as a feeder to the Erie canal. Mr. Frothingham, the resident engineer on the feeder, received directions to make exact measurements of the water afforded by this river. In compliance with these directions he measured the stream and ascertained that there were, during a period of lowest water, 11,500 cubic feet per minute available, showing a result that was considered satisfactory and which set at rest all doubts as to the value of the river as a feeder.

On the remainder of the canal, where work was under contract, steady progress was made until 1842, when what was known as the "Stop law," being an act (chapter 114), was passed for the purpose of "paying the debt and preserving the credit of the State," and which caused a suspension of work on all canals of the State. In 1843 the acting canal commissioner, having in charge the canal and feeder, made a report to the Senate, in answer to a resolution of that body, calling for an estimate of all the work necessary to complete the waterway according to the original plan of construction; also for an estimate to complete, but by substituting composite in place of stone locks for those which had not been placed under contract; and for a statement of the situation of the work that would be

required, in order that a full understanding of its actual condition might be had. The commissioner replied that the estimated amount required to finish the canal and feeder with composite locks was \$436,740.96; with stone locks, \$639,000.01, showing a saving in favor of the former plan of \$202,250.05*; he also stated that the foundations of locks, the work on aqueducts, canal embankments and all unfinished work necessitated expenditures for their preservation and security.

In 1844 some provision was made for this exigency by an act (chapter 278) authorizing the commissioners to sell the perishable materials which had been delivered along the line of the lateral canals, having been paid for by the State and surrendered by contractors, and to apply the proceeds of the sale towards preserving and securing the works from decay. This provision afforded but little relief, for although every reasonable attempt was made to dispose of the materials on the Black River canal, and at almost any price, these efforts proved entirely unavailing, for the reason that the supply of most kinds of lumber in that region was far greater than the local demand, consequently no sales could be effected. In order to realize, as far as possible, some portion of the required means for protecting the work on this canal, the superintendent of repairs on the Rome section of the Erie canal was directed, not only to sell but to use, for the repairs of the Erie canal, any of the perishable materials on the Black river route and to account for them at fair market prices. The materials, consisting of a considerable quantity of round and square timber and some plank, was hauled ten miles and used to advantage on the Erie canal, but the total sum realized from this source was only \$351.84. This sum was used in protecting the works from decay, and an additional sum was afforded by the appropriation of \$2,500 under an act of 1846 (chapter 246).

In 1846 a new State Constitution was adopted, which, after declaring that the canals should forever remain State property, provided, in section 3 of article 7, for funds to be used in completing work on the canals. The Constitution stipulated that the money should be appropriated by the Legislature from the surplus revenues of the canals. Accordingly, in 1847, an act

*So in original.

(chapter 260) was passed, which gave the canal commissioners the right to decide whether the locks should be composite or stone, and appropriated \$100,000, one-half of which was to be realized from a loan of \$30,000 due from the City of Albany and from the proceeds of a loan of \$20,000 to the Lewis county bank; for the purposes of carrying out the latter provision, the commissioners of the canal fund were authorized "to sell or otherwise dispose of said bank fund stock at their discretion, at no less than par."

On June 19 notices were published that proposals would be received by the canal commissioners, at Boonville, until July 21, for the feeder dam across the Black river, for necessary bridges and waste-weirs and for finishing all other work of the feeder, except on section No. 2. Bids were received and contracts let for the performance of this work, all of which was, by the terms of the contracts, to be completed by June 15, 1848. The contracts for section No. 2, and for the guard-lock located at the head of the feeder, which had been entered into previous to the suspension of work in 1842, had not been canceled, and the contractors, after waiving all claims for damages on account of the suspension, voluntarily proceeded to the completion of these works. On September 10 proposals for lock work near the summit level were also received and contracts awarded. At an adjourned session of the Legislature, a further appropriation of \$50,000 was made under an act (chapter 447) passed on December 13, and more work was contracted for. During 1848, in which year \$130,000 was appropriated by act (chapter 214), contracts were let for work from Boonville to Port Leyden.

On October 18, 1848, water was first let into the feeder; stop-gates, which could be closed immediately in case of accident, having previously been constructed at several of the most exposed points. While the water was being admitted, watchmen were stationed along the banks to observe any indications of failure. The water was allowed to flow through it to the depth of about two feet, and no indications of weakness were observed in the banks, when it was drawn off to allow some docking to be completed near the head of the feeder. On December 12 the water was again let into the canal for the purpose of testing the strength of the banks with a full depth of water, and to deter-

mine its capacity for supplying the requisite quantity of water for the enlarged Erie canal. On the next day a boat passed from Boonville to the head of the feeder and back again, but on the morning of the fourteenth, the water having the full depth of four feet and very little leakage being observable, a section of bank about fifty feet long was carried out to the depth of canal bottom. On the second of June of the next year, 1849, the feeder was again filled but only to a depth of two feet, the water being kept at that depth until the twentieth, when it was drawn off to repair the bottom; the water was again let in on June 23 for the purpose of feeding the Erie canal, being kept from two to two and a half feet deep until July 4; then it was increased to three feet in depth, and, except for thirty-six hours, remained so during the summer.

This depth took nearly all the water from the river for about three months, but furnished only about 9,000 cubic feet per minute, little more than half the former estimates of the supply from the Black river. The feeder was designed to pass 16,000 cubic feet per minute with a depth of four feet of water, and although it had not been tested with this depth, the experiments were deemed sufficient to prove that the capacity of the feeder would not vary much from the original design. But now a new difficulty arose, the inability of the natural flow of the river during the summer to furnish a quantity of water that would equal the capacity of the feeder.

This led to the establishment of a system of reservoirs that has grown till it is now the chief dependence of the Rome level for its supply of water. It was seen at that time that resort would have to be made to reservoirs at the numerous small lakes, lying from ten to twenty miles east of the head of the feeder, not only to obtain the quantity of water necessary for the canal, but to restore to the river the amount taken away and thus to prevent extensive claims for damages to water-powers on the river below. A survey was made of these lakes (Woodhull and Wolf), which covered an area of 1,163 acres, and received the drainage from about 3,000 acres. A temporary dam of five feet in height, built across the outlet of the former lake, was closed on November 9, and up to December 19 the water rose 1.45 feet, which was considered a fair average, no heavy rains having

appeared in forty days. Other lakes, which were examined but not surveyed, appeared to afford equal facilities with these two, so that it was thought that without doubt all the water required could be obtained from this source.

In this year, 1849, contracts for the construction of twenty-four locks were renewed on May 8, and several other lettings occurred, additional appropriations being granted under act (chapter 216), one for \$130,000 for canal work, and \$10,000 for the improvement of the Black river from High falls to Carthage. Under the latter appropriation, boats were built and suitable machinery placed upon them for removing snags and the work was begun in that year, but nothing further was done in improving the stream until 1854. In November, 1849, twenty-five miles of the canal, from Rome to Boonville, were so far completed that water was admitted and nearly the whole length had been filled, when a breach occurred near Westernville, which rendered it necessary to dam off the water. After the break was repaired, the canal was again filled and the repairing boat passed over it, and, but for the early formation of floating ice which obstructed the working of the lock-gates, a small amount of business would have been done upon it before the close of navigation.

In the spring of 1850 this portion of the canal was brought into operation and the first boats were passed from Rome on May 10, but, for the want of sluices around the locks and for other causes, navigation was not as good as desired. In consequence of the frequent delays to navigation during that year, it was deemed necessary to build the sluices and to construct a feeder from the Mohawk river at Delta, and in the following year contracts for this work were awarded. In the previous year the balance of the canal, three miles from Port Leyden to High falls, was put under contract, and to carry forward the work to completion the Legislature made another appropriation of \$120,000 under act (chapter 220).

The line from Boonville to Port Leyden was completed in time to let the water into the canal about November 1, 1850, and was brought fully into use in the spring of 1851. During this year the Legislature passed an act (chapter 181), directing the canal commissioners to cause examinations and surveys to

be made of the lakes at the head of the Black river, and also of those on Moose and Beaver rivers, for the purpose of creating reservoirs of sufficient capacity to supply the canal and feeder; the commissioners were ordered to cause such dams and other structures as were necessary to be erected on the streams and lakes flowing into the Black river above the canal feeder dam, and if such streams and lakes were inadequate to furnish a necessary quantity of water, such other dams and structures as should be necessary were to be built on one or both the Moose and Beaver rivers. The surveys were made and maps and plans adopted by the canal board for four reservoirs located near the head waters of Black river; one on the Woodhull lakes, one on the North Branch lake, one on the South Branch lake, and another on a marsh a short distance below the last mentioned, their total acreage being 2,543 acres and their capacity, 1,948,308,640 cubic feet, while the whole cost was estimated at \$43,635. The surveys made of the lakes on the Moose river showed their number to be eight, most of them of considerable size and located within about eighteen miles between extreme points. By building a dam about sixteen feet high at what was called the "Old Forge Dam," the water would be set back, it was stated, over five of the lakes, which embraced an area of 2,762 acres and which would be increased by the dam to 3,481 acres, thus affording a reserve of about 800,000,000 cubic feet of water. The canal at this time was still in progress of construction and work proceeded satisfactorily until 1853 when the canal still needed another appropriation and an act (chapter 620) provided \$75,000, the law stating that the amount should be applied: to the unfinished portion of the canal between Port Leyden and High falls (called later Lyons falls) in order to let boats into the river at the earliest period possible; to the construction of a dam at the foot of slack-water navigation; the remainder was authorized to be expended at such points as would be most beneficial to navigation. It was in this year that the reservoirs on the Woodhull and North Branch lakes were adopted by the canal board and work begun on construction. The other two were not adopted, as it was deemed advisable to make further examinations of the numerous lakes and

streams connected with the Black river, to ascertain if better and more available locations could be found.

On January 20, 1854, the Legislature enacted a law (chapter 5) providing for an amendment to the Constitution whereby appropriations could be made in the next four years to complete this canal. The amendment was submitted to the people and adopted on February 3 and the Legislature followed by passing an act (chapter 330) making \$49,000 the first appropriation, an authorization to the commissioners of the canal fund to borrow this amount being given in an act (chapter 23) of 1855.

It was in this year, 1855, that extensive examinations and surveys were made for the location of the two remaining reservoirs, the final conclusion being to construct one on the South Branch lake, and the other on Chub lake, the work being put under contract. In 1856 the North Branch reservoir was completed, and on November 12 the uncompleted work on three other reservoirs, and on the Black river improvement, was suspended by the canal commissioners as the amount of money provided by the Constitution and appropriated by the Legislature was insufficient to complete the work.

However, on November 13, 1855, the canal proper was completed and the entire length, thirty-five miles, from the Black river at Lyons falls to the Erie canal at Rome, was first used in 1856, the number of locks being one hundred and nine, size ninety by fifteen feet, with a lockage in elevation and depression of 1,082 feet. The total cost of construction of canal and feeder, together with expenditures for river improvement in later years, was \$3,581,954.

An appropriation to be applied towards unfinished work was the only direct legislative action concerning the canal in 1857. Navigation on the canal was maintained with beneficial results, and in 1862 the reservoirs were used to their utmost capacity and proved to be of great service in keeping up the supply of water for the Black River and Erie canals. An act (chapter 169) was passed on April 10, 1862, directing all construction contracts on the canals of the state to be closed on September 1 of that year. But the Black River canal was in no great degree affected, as only minor work was required when it came to the date to settle all contracts.

Turning now to the improvement of the Black river from Lyons falls to Carthage, it will be recalled that insufficient attempts were made in 1849 to better the channel. This portion seemed to be the most uncertain part of all the work pertaining to the construction of the canal. No action resulting in material improvement was taken prior to 1854, when two plans were proposed. One consisted of the use of locks and dams, the latter to extend across the river so as to elevate its surface to a height sufficient to furnish the requisite depth of water for steamboats drawing four feet; the other contemplated the formation of a new navigable channel by means of dredging and constructing jetty dams and piers. In 1854 the latter plan was adopted and the work placed under contract.

The work was prosecuted with energy until September 3, 1857, when the plan, as adopted in 1854, was abandoned by the canal board on the recommendation of the State Engineer and Surveyor, who afterwards submitted to the board new plans and estimates providing for a lock and dam at Otter creek, twelve miles below Lyons falls; these plans were adopted and on June 18, 1859, contracts were let for the work. The remaining portion of the improvement, from a point three hundred feet north of the lower dock at Lyons falls to the village of Carthage, including the Carthage dam, was advertised and let on October 10, the contractors being required to furnish five feet of water by dredging a channel sixty feet wide at the top, with sides sloping as two to one.

In 1860 an act (chapter 213) appropriated \$75,619 for payments on work necessary to complete whatever remained to be finished on the improvement of the river and on other portions of the canal.

In 1861 the dam and lock at Otter creek were finished and river navigation was opened. The dam at Carthage made slack-water navigation for twenty-two and a half miles between that place and Beach's bridge; the ten miles between this bridge and the dam at Otter creek were maintained, keeping the channel open by dredging; between Otter creek and Lyons falls the dam at the former place gave slack-water navigation.

However, this plan of improvement was not entirely satisfactory, and, in 1864, \$24,298.51 was appropriated under an act

(chapter 151) for the construction of a lock and dam of wood at such point between the mouth of Otter creek and Carthage as the canal board should decide would most effectually improve the condition of the river. Surveys were made at two points to enable the selection of a proper site for the structure; one opposite Lowville, two miles below Beach's bridge, and the other at the foot of the "long reach," three miles above this bridge. The estimated cost was from \$57,000 to \$58,000, but, as the sum appropriated was less than half the amount required, the plans were not adopted until 1865, when an additional appropriation was allowed.

With the exception of ordinary repairs and renewal of lock-gates, navigation on the canal and river met with no obstacles until 1869, when heavy damage was done along the line of the canal by a freshet, caused by the breaking away of the North lake reservoir on April 21, delaying the opening of navigation until the first of June. Claims for damages aggregating \$700,000, were presented against the State by owners of property on the Black river, and on May 5 an act (chapter 598) authorized the canal appraisers to hear and determine the claims. There were nearly two hundred and seventy cases; in some instances nothing was awarded, while to others were adjudged certain amounts, A number, dissatisfied with the awards, appealed to the canal board, which affirmed the decision of the appraisers and dismissed the appeals.

The year 1870 witnessed the completion of some extraordinary work authorized by an act (chapter 579, Laws of 1867) which provided for enlarging the first level at Rome to the size of the Erie. This was done to give the level a capacity for admitting large sized boats, drawing six feet of water, and also to allow two of these boats to lie abreast for the purpose of receiving and discharging cargoes, and at the same time to permit the passage of another boat to or from the first lock.

During the next few years the question of abandoning the lateral canals was seriously agitated. They had failed to produce sufficient revenue to defray the cost of maintenance, and the public was beginning to demand release from the burden of their support. The causes which induced this condition are fully discussed in a later chapter particularly devoted to the subject,

so that only a few facts as they related to the Black River canal need be noticed here.

The Constitution of 1846 declared that all of the canals should forever remain the property of the State. Consequently the first step toward the abandonment of any was an amendment of this Constitution. In the amended form the Black River canal was not included in the list to receive constitutional protection. The next step was the enactment of a law in 1875 (chapter 499), requiring an examination of the lateral canals in order to ascertain "whether any of them should be sold, leased, or abandoned," or, "whether any, or any portions of any of them," were necessary to be retained as feeders. The canal commissioners, upon whom devolved the duty of investigation, reported to the Legislature of 1876 in favor of the retention of this canal, on account of its availability as a feeder to the Erie. As this report was lacking in many essentials, a further examination was ordered by an act (chapter 382), which appointed a special commission for the purpose. The report of this commission was submitted to the Legislature in 1877 and in it various reasons for retaining the canal were made.

The commissioners reported that in a tour of the line the structures were all found to be in good condition, and it was thought that for several years no extraordinary repairs would be needed; that in 1876 the tolls were \$11,339.28 and the amount contributed to the Erie, \$9,080.72. During the year \$35,074.13 was expended for maintenance, and it was estimated that this sum would not be exceeded annually for some years to come. Owing to the expense of maintaining the reservoirs and feeder, which constituted a vast water-supply for the Erie, the commissioners considered that \$17,000 of the cost of maintaining the canal was properly chargeable to the Erie route, this amount having been determined by an estimate made by a competent canal officer. The commissioners further said that the canal and feeder had proved itself to be one of the main feeders to the Erie, and chiefly for this reason they were of the opinion that the interest of the State required the maintenance of the route as a useful and necessary portion of the canal system of the State. It was planned, however, if the canal was discontinued, to feed the water from the northern forests through the Lansing kill and

Mohawk to the Erie at Rome, but the commissioners stated that the plan would result in large claims for damages. In the spring of 1875, when the Erie was opened several days in advance of the opening of navigation on the Black River canal, an effort was made to fill the Erie by this method, without the use of the canal, but it was impossible to secure the necessary depth of water in the Rome level, and the Black river route had to be opened as a conduit for the water, before the needs of the Erie could be supplied. According to the commissioners the canal was needed as an outlet to the vast lumber districts of the Adirondack forest, which had no other means of transportation without long teaming, and it was predicted that the lumber business would increase rather than diminish.

Following out their suggestions, the Legislature, in 1877, omitted this canal from the provisions of an act (chapter 404), which provided for the disposition of the other lateral canals named in the act of 1875, and in 1882 the Constitution was again amended whereby the Black River canal was included with the canals that should be perpetually maintained by the State.

In 1876 the canal was taken from the eastern division and attached to the middle division of the State canal system.

Because of the large part which the reservoirs of the northern country have played in the affairs of the Black River and Erie canals, it is purposed now to treat of them at some length, picking up the narrative where it was dropped with the completion of the North Branch reservoir in 1856, and the suspension of work on the Woodhull, South Branch and Chub lake reservoirs in the same year.

Owing to grievances of riparian owners along the Black river on account of the diversion of water from that stream for the Black River canal and feeder, an act (chapter 326) went into effect in 1859 appropriating \$49,780 for the completion of "so many of the Black river reservoirs as will, with the least expense, restore to the Black river 11,000 cubic feet of water per minute; being the quantity diverted to the Erie canal." In 1860 the Woodhull and South Branch reservoirs were completed. It had been designed to construct the Chub lake reservoir, but work was never started after suspension in 1856.

The usefulness of the reservoirs was demonstrated in 1864, when it was apparent that the Erie canal would have suspended all navigation for quite a length of time during that season had it not been for the large supply of water furnished to it at Rome through the Black River canal.

The construction of another reservoir was authorized by an act in 1870 (chapter 767), the plan being to dam back Sand lake at a point about one and one-half miles below Woodhull reservoir, and in 1872 this work was completed, making the total capacity in cubic feet from all reservoirs, 1,807,620,000. The water furnished by this means was drawn only in the very dry seasons, and passed down through the natural channels of Black river and Woodhull, about twenty miles each, to the pond above the dam at the head of Black river feeder, known as the Forestport dam, which overflowed about one hundred and fifty acres; thence the necessary quantity was taken into the feeder and passed to the summit level at Boonville. From this point the canal was supplied both ways, and the balance, designed for the use of the Erie canal, was passed off by a waste-weir into the Lansing kill at the south end of the summit, and afterward a portion was taken into the canal at lock No. 34, from the Lansing kill dam, thence into the Mohawk river whence it entered the Erie canal by the feeder at Rome.

In 1880 necessary steps were taken to increase the water-storage capacity and surveys were made of the Fulton chain of lakes, numbering seven, and in 1881 these new reservoirs were brought into use. For the purpose of further restoring to the Black river its natural supply and to furnish the requisite quantity of water for the Black River canal and the Rome level of the Erie, and for the owners of the mills on the river, an act (chapter 336) was passed in 1881, authorizing the construction of reservoirs upon the Independence and Beaver rivers. In 1883 the Legislature provided \$20,000 for another reservoir, this one to be located on the Black river above Forestport pond, and a portion of that season was consumed in surveying and preparing plans, and also in making examinations of several proposed sites for a dam on the Beaver river, the latter work having been directed by the act of 1881. Although this law provided for reservoirs on both the Independence and Beaver rivers, it was

decided to build but one dam, that on the Beaver river, and this was designed to compensate the mill owners at Watertown and Carthage for the water taken from the head waters of the Black river and diverted to the Erie. Stillwater was selected as the best location for the reservoir, but work did not begin until the fall of 1885 and continued only till it was found that there was a defect in the law. Consequently all work stopped until July, 1886, when it was renewed and completed in 1887, the dam being nine feet, six inches above low water, with a spillway one hundred and fifty feet long, and a capacity of 328,000,000 cubic feet.

During the fall of 1884 work to the amount of \$15,000 was done on the new Forestport dam, but as the appropriation made in 1883 was less than one-third of the amount required to complete, the engineer estimating the cost at \$65,000, the structure was left in an unfinished state. An ineffectual attempt was made in 1885 to pass a bill for another appropriation, but finally in 1889 the Legislature decided to furnish money for a continuation of the work. The movement in this direction was accelerated by the many complaints made in 1888 relative to the diversion of the waters from Black river, so essential for manufacturing purposes.

In 1888 the complaints led the Senate to pass a resolution, directing the State Engineer to investigate and report in relation to the matter. Pursuant to the resolution the investigation was made by that official and a report thereof was presented in the next year. He ascertained that during the navigable season 16,000 cubic feet of water per minute were taken from Black river into the feeder at Forestport, 11,000 of which were diverted and flowed south to the Erie canal at Rome and the remaining 5,000 went north from Boonville and were restored to the Black river at Lyons falls.

The State Engineer made an urgent request for the completion of the new Forestport reservoir and money was appropriated for the object. The work again progressed until 1891, when it ceased on account of the funds becoming exhausted. Owing to a severe drouth in this year, the Legislature was again importuned in 1892, and, by an act (chapter 494), the sum of \$35,000 was authorized to be expended toward the completion of this important structure.

The Legislature of 1892 also made provision for raising the dam across the Beaver river at Stillwater an additional five feet (this had also been urged by the State Engineer in 1889), as the capacity of the reservoir had been insufficient to make a full restoration of the waters diverted for State use. The work was put under contract on September 6.

The contract for the completion of the Forestport dam was let in July, 1892, the work being completed in December, 1893. When the gates in the dam were closed, the water set back in consequence thereof did considerable damage to the railroad embankment of the Mohawk and Malone branch of the New York Central Railroad Company. In the year 1891 the Legislature, by an act (chapter 342), had provided for clearing the flow ground of the reservoir, the work being subsequently performed in the fall of 1892, and on this flow ground was located the railroad embankment in question. In April, 1894, the embankment was washed away and the company filed claims for damages with the Court of Claims, but was awarded nothing. An appeal was then taken to the Appellate Division of the Supreme Court where the decision was reversed and a new trial granted. The State appealed to the Court of Appeals, but the case was dismissed, and in April, 1901, the claim again came on for trial before the Court of Claims, which rendered its decision in May, 1902.

This decision was to the effect that the railroad company was entitled to a judgment against the State for \$113,927.35 unless consent were given to the company to restore and perpetually maintain its road-bed by extending a riprap-protected embankment upon State lands at a slope sufficiently flattened to withstand the action of the water. If this consent were given, the company was entitled to damages and costs to the sum of \$61,207.99.

In accordance with the foregoing decision, the Legislature of 1904, by an act (chapter 164), authorized the Secretary of State, under the direction of the Attorney-General on behalf of the State, to consent that the railroad company should reconstruct its embankment as specified in the decision.

An act (chapter 795), passed in 1896, authorized the Governor to appoint three citizens of Jefferson county and one from Lewis county, who were interested in the use of, and owners of, water-

power on the Black, Beaver or Moose rivers, to be commissioners of water-power on the Black river, serving without compensation. The commissioners were empowered to appoint gatekeepers for the State dams on Beaver and Moose rivers and to make rules for the management of these gates, and were also given authority to regulate the discharge of water through the gates at such times and in such quantity as they should deem proper, but not in such manner that would injuriously interfere with canal navigation or the navigation of that portion of the Black river used for canal purposes.

In 1898 Mr. David E. Whitford, who was selected for the work on account of his almost continuous service on the State engineering force for more than forty-five years, made a most exhaustive study of this subject of the northern reservoirs and transmitted an interesting report to the State Engineer on the water-supply of the Adirondack forest. In view of this report, which can easily be consulted, it is unnecessary to present further details, but a few excerpts from the report are fitting in this place. In part, Mr. Whitford said:—

“These reservoirs in the aggregate furnish an amount of water ample for ordinary years when the dry weather period does not demand the drawing from them the required 16,000 cubic feet of water per minute for more than three months, or say 100 consecutive days; but for extremely dry seasons, such, for instance, as were experienced in the years of 1849, 1867, 1871, 1879 and 1881, they fall far short of furnishing the required amount.

“A careful perusal of the records since the Forestport feeder was brought into use in 1849, affords convincing proof of the fact that whenever a long, dry season has occurred, the canals, as well as the mill powers on the Black river, have suffered for the want of water.

“It is true that a part of this shortage can be accounted for from the fact that the lumbermen have sometimes surreptitiously used the impounded water to float their logs.

“But a little figuring will show . . . that the combined storage capacity of all the reservoirs that have at any one time furnished water to the Forestport feeder, would be unequal to the demand when called upon to furnish the required 16,000 cubic feet of water per minute for a longer time than 100 days in succession.

"The reservoirs in present use, and which have been in use since and including the year of 1894, have a storage capacity greater by nearly 200,000,000 cubic feet than those that were in use any year previous to that date.

"Still . . . these reservoirs in delivering to the Forestport feeder the 16,000 cubic feet of water per minute, would be exhausted in less than 100 days, unless they were replenished during that time by an amount that exceeded the natural loss by evaporation and filtration."

With Mr. Whitford's report there were given tables showing the reservoirs in use in 1898 for the Erie and Black River canals, and also those for the Black River improvement and water-power on this river. In the former table there were North lake, Woodhull, South lake, Sand lake, Canachagala lake, Twin lakes, Forestport reservoir, and Forestport pond with a total capacity of 2,274,006,240 cubic feet; while the latter table included the Fulton Chain (first to seventh lakes), and Beaver river, having a total capacity of 1,650,000,000 cubic feet. Mr. Whitford said further:—

"The reports and records show that there have been at least five years during the last half century, or an average of one year in ten, when the dry weather portion of the year lasted about five months, and there have been other years when the drouth continued longer than 100 days. For all such years it became necessary to resort to extreme measures at considerable expense to procure the additional amount of water needed to maintain navigation through the extreme and extended dry seasons.

"To provide for these protracted dry seasons of five months, or say 150 days' duration, would require reservoirs capable of storing 3,500,000,000 cubic feet of water.

"This amount, located where it would flow readily into the feeder at Forestport, would, if properly managed, not only furnish to the canals the required 16,000 cubic feet per minute for 150 days, but would give to Black river, in addition to its natural flow below Lyons Falls, the 5,000 cubic feet of water per minute that supplies and flows through the canal north from Boonville.

"The water powers below Lyons Falls are receiving, in addition to the natural flow of the river, the benefit of this 5,000 cubic

Assembly Documents, 1899, No. 72 (State Engineer's Annual Report for 1898), p. 547.

feet of water per minute from the present reservoirs, so long as the 16,000 cubic feet per minute taken into the feeder is being supplied wholly from the reservoirs. And as these reservoirs are capable of furnishing and do furnish, when rightly managed, that amount per minute for nearly 100 consecutive days, the riparian owners along Black river have no reason to complain. On the contrary, when the dry season is not prolonged beyond three months they have good reason for congratulating themselves and are to be congratulated, for during that period they receive, in addition to the natural flow of the river, not only the 5,000 cubic feet per minute that flows through the canal north from Boonville, but an additional 11,000 cubic feet of impounded water per minute from the reservoirs on Moose and Beaver rivers.

"But when the dry weather continues longer than 100 days and the canals are being supplied from the natural flow of the river, the mills from Forestport to Lyons Falls are being deprived of 16,000 cubic feet of water per minute, and those below the falls of 11,000, if the Black river at Forestport affords the 16,000 cubic feet per minute.

"It will be remembered, however, that in 1849, before any reservoirs were built, the low water flow of Black river at Forestport was only 9,000 cubic feet per minute. This fact showed conclusively that the natural flow of said river could not be relied upon during extremely dry seasons to furnish the 16,000 cubic feet per minute, and led up to the building of reservoirs to supply the deficiency.

"But eight years went by before the first reservoir was completed and brought into use.

• "During these years the mills on Black river were short of water so much of the time and their owners presented so many bills and filed so many claims for damages, that it became apparent something must be done to restore to the river an equivalent for the water that was being diverted.

"To make the restitution, however, it was quite essential to first know, approximately at least, what amount was being diverted, and the preliminary work of gauging and measuring resulted in the decision that, of the 16,000 cubic feet per minute taken into the feeder at Forestport, 5,000 cubic feet fed the

Black River canal north from Boonville and was restored to the Black river at Lyons Falls, and that the remaining 11,000 went to the Erie canal at Rome.

"This was the basis for act chapter 326, Laws of 1859, which made an appropriation and directed 'the completion of so many of the Black river reservoirs as will, with the least expense, restore to the Black river the 11,000 cubic feet of water per minute, being the quantity diverted to the Erie canal.'

"If this law had been construed to mean that the reservoirs must be capable of returning to Black river the same amount per minute, during the entire number of minutes for every day each year, that was being taken from said river into the feeder at Forestport, or, in other words, if it meant that the State must impound enough water for its own use each year, so that none of the natural flow of the river would, in effect, be diverted from its natural course, it would have required reservoirs aggregating a storage capacity of more than 5,000,000,000 cubic feet, for there have been, during the past fifty years, an average of 219 days of navigation per year, and the number of minutes in 219 days, multiplied by 16,000, exceeds 5,000,000,000 as above stated.

"The amount diverted to the Erie canal during that time, however, would be a little less than 3,500,000,000 cubic feet. But if these 3,500,000,000 cubic feet limited the capacity of the reservoirs, they would, under the existing conditions of supply and demand, be exhausted in about 150 days, and for the remaining portion of the season of navigation the supply would have to be taken from the natural flow of the river.

"The most natural and reasonable interpretation of the law is to consider it to mean that the amount to be restored to Black river is the quantity diverted to the canals during the dry season of the year when its diversion would prove detrimental to the water powers along said river.

"The State officials in charge of the canals at the time this law was passed did so construe it, and assumed the dry weather period to be 115 days per year.

"Doubtless these 115 days would be a fair average, and possibly more than the real average dry weather days per year for the past fifty years.

"And if there had been reservoirs from 1849 to the present time of sufficient capacity to furnish the amount of water taken into the Forestport feeder that number of days each year, and its use had been so managed as to permit the natural flow of Black river or its equivalent, to pursue its course past Forestport for 115 days during the driest portion of each year, it would, without doubt, have amounted in the aggregate to as much more than the quantity diverted to the canals during the dry seasons when the diversion seriously affected the water powers on said river.

"But an average amount per year, for a term of years, does not serve the State, the boatmen and the mills the best possible way, for whenever the drouth continues beyond the term for which the reservoirs provide, not only do the water wheels along the Black river stop turning, but loaded boats frequently come to a standstill for the want of sufficient water to float them.

"This results in a loss to the boatmen, the State, and, for the time being at least, to the owners of the water powers along the river, the amount of the losses depending materially upon the length of time the dry weather continues after the reservoirs are exhausted.

"The losses fall the most heavily upon the boatmen for the reason that they are less able to bear them.

"The greatest loss, however, in the end, comes upon the State, and is borne by the people, the taxpayers, in paying to claimants their losses while their mills are idle.

"The remedy for this would be to impound an amount of water that would furnish the canals the required 16,000 cubic feet of water per minute for the longest dry season of the year.

"If enough reservoirs in number and capacity to do this had been constructed and brought into use at the time the feeder was completed, the cost of their construction and for their maintenance would have been very much less, it is believed, than the amount that has been expended in settling the claims for the diversion of water.

"The Adirondack region furnishes a bountiful supply of water.

"Great quantities run to waste when the streams are swollen and converted into torrents by the copious rains and melting of the deep snows so prevalent there.

"The storing and holding in reserve of this surplus water that goes to waste would not only furnish an amount which, in addition to the natural flow of the streams, would afford a constant supply sufficient for all present needs at least, but the flood-waters held in restraint would reduce the freshet volumes to such an extent as to lessen greatly the liability of damages from them.

"Whenever the additional water is impounded to supply the deficiency for the longest dry seasons, it should be stored where it will flow readily to the pond at the head of the Forestport feeder and as close to said pond as it is possible to find locations for reservoirs, so that the water can reach the feeder and canals at short notice. And if near the feeder, they would be less liable to be tampered with by outside parties.

"In constructing new reservoirs, or adding to or improving those now in use, iron and stone should be used, if possible and practicable, instead of perishable material.

"The total storage capacity of the ten North Woods reservoirs now in use is nearly 4,000,000,000 cubic feet.

"This amount used at the rate of 16,000 cubic feet per minute would hold out for 170 days if, during that time, the rainfall in that vicinity was sufficient to make up for the natural losses by evaporation and filtration.

"Therefore, if all of these reservoirs were where the water from them could flow to the feeder, the supply would be abundant for the longest dry season. Or if the water from the summit level at Boonville went but one way, so that only the 11,000 cubic feet of water per minute diverted to the Erie canal was taken from Black river into the feeder at Forestport, then the seven reservoirs and the pond that now send their waters to the feeder and the canal would last nearly to the end of the longest recorded dry season.

"But as one of the main objects for which the Black River canal was constructed was to provide a way for the boats to pass between the Erie canal and the navigable portion of the Black river, it was necessary to have enough water to supply the Black River canal both ways from the summit level, besides the amount sent to the Erie canal from the south end of the summit, through Lansing Kill, the Mohawk river and the feeder at Rome.

"And the necessity for furnishing the additional water to supply the canal north of Boonville was why the Forestport feeder was made larger than the Black River canal. . . .

"There have been no extremely dry seasons since the completion and subsequent raising of the dams on Moose and Beaver rivers to demonstrate, in a practical way, whether the waters from the present reservoirs, together with the natural flow of the streams, will be sufficient to maintain navigation on the Black river improvement, through a protracted dry season.

"But if it should be found that more water is needed for said river improvement, places should be selected where the impounding of it and the frequent and extreme changes between its high and low stages would not convert into desolate wastes those beautiful summer resorts, so eagerly sought and highly prized by the multitude of seekers for health, pleasure and recreation."¹⁰

An act (chapter 606), passed in 1898, provided \$7,000 for a tree-dam on the Red Horse chain of lakes, tributaries to the Beaver river, but upon examination this was found impracticable. The amount was reappropriated by an act (chapter 428), in 1900, with \$43,000 additional "to construct a masonry dam on the Beaver river as near as practicable to the existing state dam on said river of a height to maintain the pond at the existing water line." The structure was completed in 1903. The old dam at Forestport was also replaced by one of concrete in 1903, the money for the construction being allowed by an appropriation of \$45,000 under an act (chapter 420) in the previous year.

Turning again to the history of the canal, there are a few more events to record. Many of the locks were becoming so dilapidated that in 1887 there was started the work of rebuilding the worst of them, the Legislature making appropriations year by year. This work of rebuilding continued till 1900. The chief trouble was the pressing in of the side walls, so contracting the chambers of the locks that, in order to continue the passage of boats through them, the masonry had been cut away to such an extent that in some cases entire face stones had been removed. The locks were rebuilt of the same dimensions as the original structures.

On July 23, 1897, there occurred a break in the towing-path of the feeder near Forestport, which was the most costly and

¹⁰*Assembly Documents*, 1899, No. 72 (State Engineer's Annual Report for 1898), pp. 547-552.

disastrous breach that had happened in many years. The break occurred a short distance below the head of the feeder, at a place where the channel is carried along the side of the very steep river bank about seventy feet above the river, and as the soil is chiefly sand with thin layers of clay, the water tore an enormous hole in the bottom and towing-path bank of the feeder, four hundred feet long and fifty feet deep. It required a large force working night and day for thirty days to repair the damage, and during this time all navigation on the Black River canal was suspended and this source of water-supply to the Erie entirely shut off. The expense of repairs was \$62,781.78. In the next year, on May 23, another serious break occurred near the same place and similar in all its features to that of the previous year. Again navigation was suspended on the canal, this time for twenty-one days, and the Erie was deprived of its supply from the reservoirs. It cost \$50,764.47 to repair this break. By this time the canal officials were becoming suspicious that both of the breaks had not been accidental, but were caused by the maliciousness of persons who might be benefited by having large sums spent in the locality.

During the summer of 1899 information was received which confirmed the officials in their belief, and accordingly an investigation was begun and while it was in progress, a third break occurred on September 18, at the same place and under very suspicious circumstances. This time the breach was discovered early, and, by great efforts, those in immediate charge were able to prevent much of the bank from being carried out. However, the necessary repairs required a large force day and night for seventeen days and cost \$17,089.72, making a total of \$130,635.97 in the three years.

By this time the Superintendent of Public Works had become firmly determined to bring the perpetrators of these acts to justice, and he pursued his investigations with renewed energy. After obtaining many facts and clues, he placed the case in the hands of the Pinkerton National Detective Agency, with the result that some fifteen or twenty suspected persons were arrested, one of them being traced to Michigan and brought back through extradition proceedings. The grand jury of Oneida county in-

dicted thirteen of them, and the first case was called for trial at Rome on April 9, 1900, a hotel keeper being the defendant. The jury failed to agree and a second trial followed, lasting a week. This time the defendant was found guilty and a sentence of four years in Auburn prison was the result. The next to be tried was convicted and sentenced for three years, and three others, who plead guilty, received sentences of one year each. Heavy fines were also imposed on three persons who also plead guilty, two were released upon their own recognizance, having been witnesses for the State, and against the remaining three there was no evidence except that of those who confessed. As the statute did not permit a conviction upon the evidence of a conspirator or of a person jointly guilty of the crime, the indictments against them, upon motion of the District Attorney, were dismissed. This summary action taught a much-needed lesson and put a stop to such breaks.

In 1900 the canal between Boonville and Lyons falls, known as section No. 2, was believed to have survived its usefulness and the Superintendent of Public Works recommended that this portion of the line should be abandoned. In support of this recommendation, he stated that the cost of operation in that year was one dollar per ton of freight carried, being \$15,639.74 for moving 15,660 tons. In 1901 and 1902 it became still more apparent that the section was being operated at a loss, for in the former year the expenditures for operation were \$16,873.89, while the tonnage was 11,674 tons, or \$1.45 per ton; in the latter year the tonnage was 8,300, costing \$13,207.66 for operation, or \$1.58 per ton. It was believed that the shrinkage in business on this section was due to natural causes and would remain permanent.

Since 1900 the Superintendent of Public Works has continued in his annual reports to recommend the abandonment of this portion of the canal, and in his annual message to the Legislature in 1905, Governor Higgins advised the same policy. He said:

"The Constitution of the State (Article VII, section 8) prohibits the sale of the Erie Canal, the Oswego Canal, the Champlain Canal, the Cayuga and Seneca Canal, or the Black River Canal, and imposes upon the State the perpetual management of the same. Whenever it appears that any portion of the canal system has so far survived its usefulness as to make its maintenance by

the State a burden with no corresponding benefits, the Legislature should submit to the people the proper constitutional amendment to permit the abandonment of such portion.

"The Black River Canal from Boonville north is now practically an abandoned waterway, serving no useful purpose except to those employed to manage it under the constitutional mandate above referred to. I therefore recommend that so much of said canal be leased, sold or otherwise disposed of, and that the question be submitted to the people for their determination."¹¹

To furnish the Barge canal with an adequate water-supply, it will be necessary to retain the Black River canal as a feeder and, in addition, to seek other sources of supply. It is planned to make one of the additional reservoirs by throwing a dam across the Mohawk a short distance south of the junction of the Black River canal and the Delta feeder. This will necessitate a change in a portion of the canal, the plan being to cut a new channel by continuing the Westernville level along the east side of the valley beside the proposed reservoir, to cross the Mohawk below the new dam by an aqueduct or in the pool of a second dam and there to rejoin the present canal. It is not intended to change the canal otherwise, but to retain it in its present condition as a navigable feeder, unless the recommendations are heeded and the portion north of Boonville is abandoned by constitutional amendment.

¹¹*Senate Documents*, 1905, No. 2.

CHAPTER X.

THE BALDWINSVILLE CANAL AND THE SENECA RIVER TOWING-PATH.

Including the building and control of the canal by Jonas C. Baldwin and his sons, the improvement of the towing-path and the appropriation of the canal by the State, and their maintenance to the present time.

When the Western Inland Lock Navigation Company was incorporated in 1792, its officials intended to continue their work of improvement westward through the Oneida and Seneca rivers, along the line of existing natural water communications, until they reached Cayuga and Seneca lakes. At the place which we now know as Baldwinsville the Seneca river was interrupted by a fall, to overcome which necessitated an independent canal, but the company never performed any work beyond Oneida lake, and a settler, named Jonas C. Baldwin, undertook and accomplished privately what the company had planned at this point.

In 1809, after the company had formally relinquished all of its rights west of Oneida lake, a petition was sent to the Legislature by Dr. Baldwin,* in which he stated that, at much expense, he had constructed a canal and lock to permit navigation around the falls and, therefore, he asked from the Legislature authority to enable him to collect tolls for boats passing through the canal. The Legislature listened to the appeal and enacted a law (chapter 54), which granted the desire of the petitioner, also giving him authority to build a dam, seven and a half feet high, at McHarry's reef (located by the falls), for improving navigation in the river above, provided that he erected and maintained "a canal and lock for the passage of the largest boats usually employed in said river from above said dam, to the still water, two feet deep, below the same, said canal and lock to be at least twelve feet wide, and said lock to be at least seventy-seven and a half feet long within the gates, and with a sufficient depth of water to pass

*Dr. Baldwin had received the appointment of physician and surgeon to the Inland Lock Navigation Company, residing at Little Falls during the work of construction there, until 1797. In 1807 he had begun a dam across the Seneca river at Baldwinsville, and in 1808 had built a canal and lock for the passage of boats around the dam.

boats, drawing two feet water, when loaded." The privileges granted by the law were to continue for a term of twenty years.

In 1817 complaints were made to the Legislature that the dam, canal and locks, authorized by the act of 1809, had not been built in accordance with the provisions of that law and that navigation in the Seneca river was more difficult than ever. As remedial action, an act (chapter 252) appointed James Geddes (an engineer employed in making surveys and plans for the Erie canal) as a commissioner to examine the works and to report to the Legislature of 1818 whether the allegations were true and what alterations, if any, were necessary to make possible the passage of loaded boats through the canal and locks. In compliance with the statute, Mr. Geddes did his work of inspection and reported to the Legislature that portions of the apron of the dam, which was supposed to be so built as to afford passage for rafts, had not been constructed as ordered, and that the locks leaked badly, but he stated that Dr. Baldwin purposed to remedy these defects by building new structures. The complaints had charged that there were numerous apertures in the dam, through which flowed so much water that it was impossible to feed the canal properly. Mr. Geddes reported that this condition had existed for about two months during the dry season of 1816, at which time, even after being unloaded, boats were taken through the canal with difficulty. Mr. Geddes stated that to insure successful navigation a tight dam was necessary, and that at the point where the boats were passed into the river below the falls excavations should be made so as to afford the requisite depth of water, navigation having been impeded at this place also.

In 1819 Dr. Baldwin conveyed his interests in the dam and canal, and all of the privileges secured from the Legislature in 1809 to his sons, Stephen W. Baldwin and Harvey Baldwin, who, by an act (chapter 192) of 1827, were accorded, for a term of twenty-one years after 1829, the same rights as had been granted to their father in 1809. By the new act, however, the owners were not required to maintain the canal and lock for the passage of boats around the dam unless the canal board decided that they were necessary for the accommodation of commerce on the Seneca river. In March, 1831, the canal board passed a resolu-

tion to the effect that commerce on the river made it imperative that the canal and locks should be kept in operation in order to connect navigation above the dam with that below, in such manner that boats traversing the Erie and Oswego canals should encounter no difficulty in passing through the canal and locks. The resolution required the work to be finished on or before December 1, 1831. The work was completed within the time limit and at the finish the canal was about three-fourths of a mile in length, having a guard-lock, which had been built at the dam, and a lock with a ten-foot lift at the lower end of the channel, the dimensions of the locks being ninety by fifteen feet.

In 1836 steps were taken to properly join this canal with the main branches of the system. By an act of that year (chapter 303) the canal commissioners were authorized to build a towing-path from Mud lock, at the junction of the independent Oswego canal with the canalized Seneca river, westerly along this river to such place in the village of Baldwinsville as they might deem proper. They were given the right to construct the towing-path on either side of the river and to fix the tolls so that the canal would pay five per cent on the original investment in addition to the necessary repairs. The amount at their disposal was limited to \$4,000. In 1838 (chapter 306) this amount was raised to \$15,000. This towing-path was completed in 1839 at an expense of \$14,864.26. It was 5.36 miles long, beginning at Mud lock "by a bridge across the Oswego canal, at the foot of the lock, and [was] continued by a floating bridge across the Seneca river, 367 feet long and 19 feet wide, with an elevation on the northerly side of the river, of the requisite width and height for the passage of boats; and thence by a towing path on the northerly side of the river, extending up to the lock at Baldwinsville."¹

The Legislature in 1836 also authorized the canal commissioners to examine the Oneida and Seneca rivers and to report on the practicability of steamboat channels four and one-half feet deep with a base of sixty feet, but, as the law contained no provision to pay for the work, the examinations were not made. At this time the Baldwins were still operating their canal, and in 1848 and 1849 they petitioned the Legislature to renew the act of 1827,

¹*Assembly Documents*, 1840, No. 60, p. 42.

which granted them rights for twenty-one years. However, they were denied a further extension, and in 1850 a bill was passed, by which the State assumed possession of the works. Doubtless this was due to remonstrances signed by more than four hundred residents of Baldwinsville, who united in a request that the State should take the works into its own hands, making to the owners a fair compensation. The bill became chapter 153 of that year, and besides authorizing the canal commissioners to take possession and appropriating \$15,000 for the purchase price, it directed that the canal and locks should be made of such size as to admit the boats at that time navigating the Oswego canal.

The act also appropriated \$3,000 for making improvements in the canal and river. As it was found necessary to take down and rebuild the lift-lock, sinking the foundation from two to two and one-half feet lower than the former foundation in order at all times to obtain four feet of water on the lower miter-sill, the sum appropriated was deemed altogether inadequate for the work in hand. It was finally decided to rebuild this lock of wood, which could be done without exceeding the appropriation of \$3,000. This was completed in the spring of 1853. Under this act also, navigation was opened for eleven and three-quarters miles in the Seneca river to Jack's reef, being the distance that water was set back by the Baldwinsville dam. In 1854 an act (chapter 333) placed the Baldwinsville canal and the Seneca river improvement under the control of the canal board and under the same regulations in regard to tolls, superintendence and repairs as the other canals of the state. In 1862, however, the board said that the Baldwinsville canal "formed no part of our canal system when the Constitution pledged the revenues to the repairs of the canals and the payment of the Canal Debt. It is not supposed that the repairs of this canal, for lock and dam, at Baldwinsville, can be paid for out of the canal tolls collected on other canals recognized by the Constitution."² Consequently the canal was repaired by monies from the general fund.

In 1863 \$26,000 was appropriated for changing the location of the locks at Baldwinsville and for rebuilding them of stone.

²*Assembly Documents*, 1862, No. 92, p. 3.

The construction of a guard-gate to take the place of the old guard-lock, which was a timber structure and had decayed to such an extent as to render it entirely worthless, was completed in 1866 at a total cost of \$10,985.70. Chapter 677, Laws of 1869, provided that whenever it became necessary to rebuild the dam at Baldwinsville it should be constructed of stone. In 1870 the Legislature appropriated \$6,000 for rebuilding this dam, but when the structure was examined it was found to be in good condition and the appropriation was not used.

This canal was not under repair contract and the result was that the channel was blocked in many places by stone and other material.

In 1871 the floating bridge in the Seneca river, situated at the junction of this river with the Oswego canal, which had been maintained at a large annual expense to the State, was dispensed with and in its place a new towing-path about half a mile long was constructed on the west bank of the Seneca river. This improvement, besides vastly improving navigation, lessened the cost of the maintenance of the canal.

The towing-path from Baldwinsville to Jack's reef was abandoned in 1888 on account of disuse, and in 1891 the lock at the lower end of the Baldwinsville canal was thoroughly repaired. The sides of the lock were taken down to the water-line, new approaches to the lock were built and four new gates inserted.

Under chapter 113, Laws of 1893, \$35,000 was appropriated for rebuilding the Baldwinsville dam. Plans were prepared for a stone dam fourteen feet in height, twenty-one feet in width at bottom and six feet at the top, with a curved spillway, resting on a rock foundation. This dam was completed in the fall of 1894.

In general the route of the Barge canal follows the course of the Seneca river from its mouth to its junction with Crusee creek. Thus the Baldwinsville canal and the Seneca River Towing-path will be on the line of the main Erie canal across the state, but it is planned to pass the dam at Baldwinsville (which will be raised about fifteen inches) by an independent channel on the south side of the river, probably leaving the existing canal nearly in its present condition, to serve as a head-race for the various water-powers along its banks.

CHAPTER XI.

THE ONEIDA RIVER IMPROVEMENT.

The plans for betterment by the Western Inland Lock Navigation Company; the slight improvements by private enterprise; and the State's share in providing for navigation, to the present time.

The Oneida river, or the Onondaga river as it was called in early Colonial times, flows westerly from Oneida lake to a confluence with the Seneca river at Three River Point, where the two unite to form the Oswego river. This stream was a link in the chain of natural water communications between the Hudson and the inland lakes, which the first white explorers found the Indian tribes using as their avenues of travel. These watercourses were adopted by the settlers as channels of commerce and when their improvement was systematically undertaken by the Western Inland Lock Navigation Company in 1792, this river was included in the plan for betterment. However, as has already been told in the account of the first attempts at improving the State's natural waterways, the company failed to do any work west of Oneida lake, except to make examinations and estimates for improvement, and all of its rights west of that lake were relinquished on April 11, 1808, but the stream in its natural state continued to be used for transportation until the Erie canal was opened.

As we have seen in the account of the building of the Erie, when the project for a canal to Lake Erie was being agitated, the route by the way of these natural streams was very tenaciously advocated for many years. In 1808 the first survey for a waterway to Lake Erie traversed the Oneida river as a part of the popularly accepted course. From the opening of the old Oneida Lake canal in 1835 to the dismantling of its locks in 1863, and again during the short existence of the New Oneida Lake canal in 1877 and 1878, this watercourse constituted a link in a short passage between the eastern part of the Erie canal and Oswego. In the various schemes for barge or ship canals, for which the State or National Government has made surveys, at least a part of

this river has usually figured. And now in the construction of the Barge canal this stream is being utilized as a portion of the trunk line of the Erie canal.

In 1809, when James Geddes made his report of the surveys of the preceding year, he stated that the length of Oneida river was eighteen miles, and its fall twelve and a half feet. This waterway seems to have received no further legislative notice till 1824, when, in answer to a petition, the Legislature passed an act (chapter 298) authorizing "Gustavus Jewell, Myron Stevens, and their associates, to erect a wing-dam in that part of the Oneida river which is known by the name of the Caughdenia [Caughdenoy] reef," upon the condition that the water in the river above the reef should not be raised above its normal level, and that the dam should be so constructed as not to obstruct navigation. The wing-dam was subsequently erected and a lock was connected with the structure for the accommodation of navigation.

In 1828 an act (chapter 229) provided for improving the river, saying, "The acting canal commissioners . . . are hereby authorized and required to lower the Oneida lake, as far as they shall deem it practicable to lower the same, by excavating and removing the rock and other obstructions that retard the passage of the water near the outlet of the said lake, and between the said outlet and the head of Caughanoy [Caughdenoy] reef, in such manner as to create a passage of sufficient depth and width for boats of one hundred tons to pass, whenever individuals feeling an interest therein, shall raise and place at the disposal of said commissioners for that purpose, a sum of money sufficient, in the estimation of said commissioners, to effect the same." The act also conferred the authority upon James Porter and George C. Schroepfel to construct dams and locks, the former at Caughdenoy, and the latter at Oak Orchard, these persons having petitioned the Legislature for such privileges.

One year later numerous petitions were presented to the Legislature, praying for the lowering of the waters of Oneida lake and for improving the navigation of Oneida river. The report of the Assembly committee, to which this subject was referred, made it evident that the wing-dam, which had been erected by Mr. Jewell, raised the water in the river and also in the lake above

the normal level. This was contrary to the provisions of the act which permitted the erection of the dam. In consequence of this report, the Legislature enacted a law (chapter 333), which required the canal commissioners "to remove the dam at Caughanoy [Caughdenoy] reef, in the Oneida river, and also to remove the obstruction at or near the outlet of Oneida lake, so as to permit the water in said lake to subside to the level which it occupied before the erection of the said dam." This act also ordered investigations, saying: "The canal commissioners shall make such surveys and examinations as they shall deem necessary, and report to the next legislature their opinion of the practicability, expense and utility of lowering the Oneida lake, by cutting down the outlet thereof, and rendering the same navigable." Evidently the provisions of the act of 1828 were never executed, for this law of 1829 repealed that of the preceding year, as well as that of 1824. In this same year a petition from Utica, asking that the lake be lowered, was referred to the canal commissioners, who reported that the lake could be lowered thirty inches at slight expense, and that by the erection of one or two dams and the same number of locks a navigable communication could be effected between Oneida lake and the Oswego canal at Three River Point.

Pursuant to chapter 333 of the laws of 1829, the commissioners assigned Orville W. Childs, an engineer upon the canals, to remove the dam at Caughdenoy and to make the surveys and examinations ordered by the law. In transmitting the engineer's report in 1830, the commissioners stated that the removal of the dam and the obstructions in the outlet, which consisted chiefly of eel weirs, had been instrumental in allowing the waters in the lake to subside to their natural level. In this report, Mr. Childs said: "The lake may be lowered, say from 15 to 21 inches, by making a cut through Caughanoy reefs, of sufficient dimensions to reduce the water above said reefs 6 inches, and extending said cut upon the same level through the reefs at the outlet, giving it sufficient width to discharge all the water passing in a low time.

"The estimates are made with reference to said reduction. To improve said river for canal navigation, I propose to construct a towing path along its margin the whole distance, and to lower its bed where it rises above the contemplated bottom line, giving

a base of 40 feet in width in all places, except where it is designed to lower the water. And to improve said river for steam-boat navigation, I propose deepening the channel sufficient to give a depth of 4.50 feet of water, with a base of 60 feet in all places, except at the outlet and Caughanoy reefs, where a broader cut will be necessary."¹

Of the estimated cost, the report said: "A good navigation from Three-river Point, on the Oswego river, to the Oneida lake, can be made for canal boats, or boats towed by horses, for the sum of \$86,398.34, and for steam-boats for the sum of \$59,923.10."² The survey and estimate was corroborated by the report of E. F. Johnson to the Legislature of 1835 upon a survey made for the Ontario and Hudson Steamboat canal proposed in that year.³

Almost annually the Legislature was requested to provide for improving the navigation of the Oneida river. In 1836 these appeals resulted in the passage of an act (chapter 443) directing the commissioners to report on the practicability of a steamboat channel of the dimensions specified in the report of Mr. Childs in the year 1830. As no money was provided for the survey, the officials made no effort to carry out the provisions of the act.

In 1838 a petition to the Legislature for river improvement became effectual, for, by an act (chapter 284) of that year, the canal commissioners were directed to survey the Oneida river and to report to the succeeding Legislature concerning the practicability of making the river navigable for the smaller class of steamboats, by the construction of locks and short canals. The proposed canal was to be built around the principal reefs between Oneida lake and Three River Point and its depth was not to exceed four and one-half feet.

After a favorable report on the project by Orville W. Childs, who was then chief engineer on the canals, on April 29, 1839, (chapter 284) the Legislature appropriated \$75,000 towards the improvement of the Oneida river for the navigation of steamboats, provided that all expenditures could be kept below that amount. With an appropriation so limited, a navigation for

¹*Assembly Documents*, 1830, No. 68, p. 5.

²*Id.* p. 1.

³*Assembly Documents*, 1835, No. 195.

steamboats, of the smaller class only, could be provided for. In the plan adopted for this improvement there was given to the cuts a bottom width varying from thirty to eighty feet, and to the chambers of the locks a width of thirty feet and a length of one hundred and twenty feet. A depth of four and one-half feet of water was to be provided in all places during the lowest stages of the river. The length of this improvement was nineteen miles and four chains and the whole fall in the river was 9.14 feet. These plans called for two locks and one dam. As most of the work was subaqueous or wet excavation, the spring freshets delayed its progress considerably. An excavator, operated by horse power, placed upon floats made fast to the shore, constituted the principal means employed in forming the cuts. This of itself was a very slow method, but it was considered that this was the only means that could be advantageously employed. In 1840 the lock at Oak Orchard, and in 1841 the dam at this place and the lock at Caughdenoy were completed, so that in 1842 the river was navigable for boats of three feet draught from the Oswego canal at Three River Point to the foot of the rapids at Caughdenoy, a distance of fourteen miles. The number of lock-ages at the Oak Orchard lock during this season was over two hundred.

As told in detail elsewhere in this volume, work throughout the entire system of State canals was suspended by the act (chapter 114) of 1842, known as the "Stop law." Consequently the completion of the improvement between Caughdenoy and Oneida lake was delayed until an act (chapter 261) of 1847 appropriating \$20,000 for the purpose. Pursuant to the provisions of this law, surveys and estimates of the cost to complete the improvement were made and the contracts were let on September 1, 1849. Work progressed rapidly on one section, but on the other the contractors abandoned their work and the reletting occasioned a delay of several months.

In 1849 steamboats were under construction at Brewerton so as to be all ready on the opening of the canal. In the spring of 1850 these boats began running on the lake and river. Chapter 267, Laws of 1850, had provided for the construction of a draw in the bridge over the Oneida river at Oak Orchard, by the towns of Clay and Schroepfel. At the opening of navigation the work

of constructing the draw had not been commenced, nor had any portion of the old bridge been removed preparatory to the passage of steamboats through the river. The result was a conflict between the boatmen and town officials, which ended in the destruction of one six-foot span of the bridge, and subsequently another span was knocked down by the boats. These forcible measures hastened the construction of the draw, which was completed during that season.

An act (chapter 399, Laws of 1874), authorized the rebuilding of locks in the Oneida river and the lowering of them so as to conform to the depth of locks on the Erie and Oswego canals, providing \$60,000 for the purpose. The law also included an appropriation of \$40,000 for dredging and removing obstructions in the river. The engineering department estimated the entire cost of the contemplated work at \$290,000, and although contracts were let in February, 1875, they were soon canceled and nothing was done.

The Superintendent of Public Works, in his report of 1883, suggested the abandonment of the Oneida River Improvement. He gave as his reasons the fact that it had proved to be an impracticable route from Oswego to Albany for canal boats; also that, while there was little or no trade over this channel, its maintenance called for quite a large yearly expense, and that its abandonment and the consequent lowering of the level of Oneida lake and Oneida river would permit more than one thousand acres of exceedingly fertile land to be reclaimed.

Chapter 568, Laws of 1889, authorized and directed the Superintendent of Public Works "to deepen the Oneida River improvement between Three River Point, on the Oswego canal, and the Oneida lake, by raising the dam at Oak Orchard, and, if practicable, by raising the water at Caughdenoy, so that the water in said river at low-water mark shall not be lower than its original low-water mark, and as much higher as is practicable by raising the water as aforesaid, and by dredging out or otherwise deepening said river at such points as in his judgment will most improve its navigation," \$10,000 being appropriated for the purpose. Under this law a contract was let in January, 1890, and completed during the same year, to the extent of the appropriation.

The work consisted in removing bars by dredging at many places throughout the length of the river, and in driving spring piles that would keep boats in the channels where the current is strong.

The Oneida river is still a part of the State system of navigable waterways, being used to a limited extent for the commerce of the lake and river. Through the central portion of the state, the Barge canal follows the route of the old natural watercourses, utilizing this river, but shortening the distance several miles by cutting across the large bends. It is planned to place a lock a short way below Oneida lake, but the elevation of the remainder of the stream will be governed by the dam at Phoenix, on the Oswego river. Thus this waterway will be again in the main line of communications between the Hudson and Lakes Ontario and Erie.

CHAPTER XII.

THE SHINNECOCK AND PECONIC CANAL.

Traces of an early canal opened by an Indian chief; the survey by the State in 1826, and again in 1879; the incorporation of private companies in 1828 and 1848 to build Long Island canals; the beginning of the canal in 1884, and its subsequent completion and continued use.

In building the Shinnecock and Peconic canal, together with two neighboring channels, New York opened the only salt-water canal belonging to the State and also the only one constructed for more than purposes of transportation, for this channel was excavated not alone to accommodate the passage of boats, but also to reclaim a waning industry. Although the cost has been large, the renewed fish, clam and oyster industries are said to much more than compensate all expenditures. The canal connects two bays lying on opposite sides of the eastern part of Long Island, the bay on the north being an arm of Long Island sound, while that on the south is an indentation of the Atlantic, which has become landlocked in recent years. Speaking of the place where this canal is situated, a recent writer says: "Canoe Place—Merosuck, was the portage between the Great Peconic and the Shinnecock Bays, a narrow isthmus, formerly the open channel between two adjacent islands of the once "Gebrokne Landt.'" The author adds in a foot-note: "Traces still remain of the canal opened by Mongotucksee—Long Knife, Chief of the Mohawks."

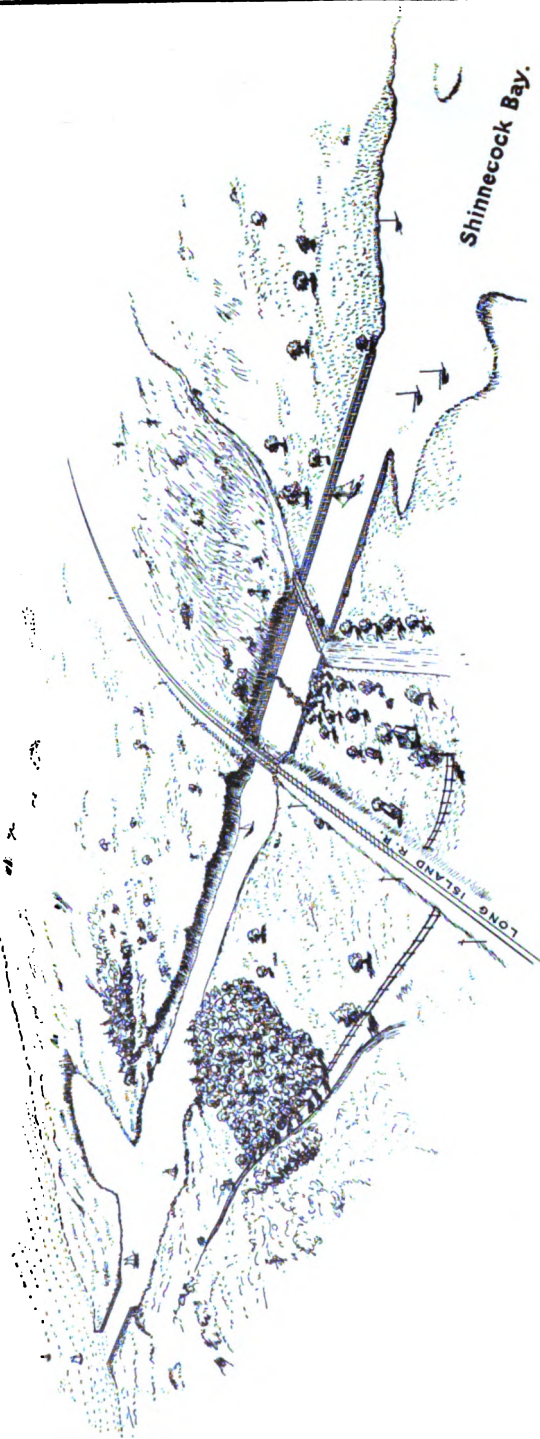
That difficulties similar to those which finally prompted the opening of this canal were of early origin, is shown by the following note in the town records of Southampton, which is entered under date of August 18, 1652:

"It was concluded by the voat of the Generall Court that there shall bee yet another attempt made for the letting out of Shinnecock water, for the regaining of the salt marsh meddow."²

¹*Early Long Island, A Colonial Study*, by Martha Bockée Flint, p. 49. (New York, 1896.)

²*The First Book of Records of the Town of Southampton*, p. 87. (Sag Harbor, 1874.) Page 105 of original manuscript record.

Great Peconic Bay.



Shinnecock Bay.

SHINNECOCK AND PECONIC CANAL LONG ISLAND, N.Y.

By concurrent resolution in 1879, the Legislature directed the State Engineer to make "a survey and examination as to the feasibility of making permanent communication between Peconic and Shinnecock Bays, in the county of Suffolk, by means of an opening or canal between them, with the view of aiding in keeping open an inlet into the ocean from Shinnecock Bay, and of navigation between the two bays, for smacks, sail-boats, and other like craft of light burthen,"³ and to report his opinion of the proper place for the canal, and its probable cost and annual expense.

In his report on April 7, 1880, Horatio Seymour, Jr., the State Engineer, referred to a former report, which Holmes Hutchinson had made to the canal commissioners in 1826, on a canal to connect these bays, which was a part of a proposed water communication extending from Peconic to Gravesend bay.

Mr. Hutchinson said in his report: "To accommodate the vessels that usually navigate Southold Bay and the Great South Bay, the canal should be 40 feet wide on bottom, 60 feet wide on the top, and five feet deep. The locks to be 22 feet wide, and 90 feet long between gates. . . .

"The examination commences in Southampton, and the first canal would be half a mile in length, to join Southold Bay with Southampton Bay at Canoe place. The soil is sand and gravel, and the deepest point of excavation would be 25 feet.

"A lock should be constructed at each end of the canal to retain the water at the elevation of high tide, and make slack water between the bays. The tide rises at this place about three feet, and as there are about three hours' difference in the time of high water in the bays, the locks will be necessary to prevent a rapid current in the canal, and will permit the passage of vessels at all times of tide."⁴

The plan required a draw bridge and the construction of a wharf in Southold⁵ bay to form a harbor and to facilitate

³*Session Laws*, 1879, p. 634.

⁴*Assembly Documents*, 1880, No. 108, p. 2.

⁵Mr. Hutchinson evidently applied the name Southold to the larger bay, which is now known as Peconic, rather than to the smaller bay, which at present bears that name.

the entrance of vessels into the canal. Mr Hutchinson estimated the cost at \$30,913.80.

For the purpose of executing a part of this plan, the Long Island Canal Company was incorporated April 15, 1828, with a capital of \$200,000. This company was authorized to build canals from Gravesend bay to Fire Island inlet. On April 8, 1848, the Long Island Canal and Navigation Company was organized, with a capital of \$300,000, and was empowered to open canals from Gravesend bay easterly to Peconic bay. No results were achieved by either company toward carrying out the purposes for which they were incorporated.

Mr. Seymour adopted the location and general scheme chosen by Mr. Hutchinson. In reviewing the early report, he said: "The place recommended by Mr. Hutchinson seems designed by nature as a route for a canal connecting Peconic and Shinnecock bays, the distance across from one to the other is about half a mile, and the ridge is cut down to such an extent as to make necessary a cutting of only 25 feet.

"It has been for many years a carrying place between the two bays, as its name [Canoe Place] implies, and there is every indication of there having been at some time a water communication between the two.

"Within a few years this region has been surveyed by the government and the rise and duration of the tides determined. At certain periods, the difference in elevation of the water in the two bays is $2\frac{3}{100}$ feet, which would cause a velocity in a canal such as Mr. Hutchinson recommends, of 330 feet per minute, nearly five times as great as would be safe in a canal, the banks of which are composed of loose sand. A lock should be constructed of the size recommended by Mr. Hutchinson to protect the canal against the wear of the current. This can be furnished with a double set of gates so as to pass boats at all stages of the tide. A break-water will be necessary in Peconic bay to protect the entrance to the canal.

"To maintain the canal will require a force sufficient to operate the lock and make needed repairs to the structures and prism. Some dredging must be done from time to time to prevent the entrance to the canal from filling up."^a

^a*Assembly Documents*, 1880, No. 108, pp. 2-3.

Mr. Seymour's estimated cost for construction was \$35,000, and for yearly maintenance, \$1,500.

Nothing further was done until the Legislature of 1884 appropriated \$12,000 (chapter 508) for commencing the construction of this canal, the law providing for the maintenance of the channel by Suffolk county, but investing the title to the property in the State. This sum could be considered but a beginning, for, as we shall see in a later report, the State Engineer estimated the cost at this time to amount to \$64,000, with a probability of additional structures, which were found necessary afterward, at an increased expense of about \$24,000.

Work of construction was commenced during this year. The next year an additional appropriation of \$15,000 was made (chapter 525). In 1886 a like amount was provided (chapter 330). In 1887 chapter 460 appropriated \$22,000 for the completion of the canal, provided the State Engineer should certify that this amount, in his judgment, would be sufficient to complete the work. At the next session of the Legislature chapter 270 provided \$4,500 for extending the piers on the easterly end, \$1,500 for extension of those on the westerly end of the canal and \$4,000 for improving the channel. Chapter 302, Laws of 1891, made an appropriation of \$15,000 for the completion of the canal.

In reporting the progress of the enterprise in 1890, the State Engineer gave a brief review of the project, which declared the objects sought in constructing the canal. He said:

"The excavation of the channel between Shinnecock and Peconic bays, . . . has been in progress for a number of years, Shinnecock bay, with an area of more than twenty square miles, was formerly connected with the Atlantic ocean, but for a number of years the inlet from the ocean to the bay has been closed by the formation of a sand beach; the result has been that this large bay is land-locked, the tide does not ebb and flow in it and it receives only the fresh water flowing from the surrounding hills. Evaporation from the surface about equals this influx of fresh water. It is claimed by the residents in the vicinity that the water of this bay has become brackish, that the fish life in it has been seriously affected and that this has been unfavor-

able to the health and business of the people living in the neighborhood.

"It was represented to the Legislature in 1884 that a channel between this bay and Peconic bay, which is an arm of Long Island sound, would give a tidal flow between the two bays, would change the unsanitary condition of Shinnecock bay by the introduction of salt water and possibly also would aid in the restoration and preservation of an inlet between that bay and the ocean. My predecessor, in 1884, made an estimate of the probable cost of such a channel, amounting to about \$64,000, stating also that it was entirely probable that jetties or breakwaters at the Shinnecock bay end of the channel would be necessary, but not including their cost in that estimate. These breakwaters were found to be absolutely necessary for the protection of the channel and there was also found to be necessary a highway bridge over the proposed channel and also a stop-gate, which were not included in the original estimate. These would cost about \$24,000, making the estimated expense of the whole work \$88,000, as designed by the State Engineer Elnathan Sweet."

In 1892 the State Engineer said: "The close of the present year has witnessed the completion of the Shinnecock canal, connecting the waters of Peconic and Shinnecock bays on Long Island, at a total cost of about \$98,000. This work . . . has by reason of this policy of insufficient appropriation cost about \$10,000 more than originally estimated. . . . Several attempts had been made to open and maintain a channel from Shinnecock bay to the ocean on the south, which had thus far resulted in failures, and as a consequence, a great many fishing industries were entirely destroyed and a whole community were obliged to seek a livelihood in other pursuits."

Continuing, he said that during the preceding three years water had flowed through the canal at periods of very high tide, with a most gratifying effect upon the oyster growth in Shinnecock bay, and that, whereas three years before there had not been probably a single barrel of these shell-fish in the whole bay, in the previous year 25,000 bushels of seed oysters had been taken out, besides thousands of barrels of mature oysters of the finest

¹*Assembly Documents*, 1891, No. 66, pp. 23-24.

²*Assembly Documents*, 1893, No. 35, pp. 26-27.

flavor, conservatively valued at \$100,000. The dredging had been extended to the deep water of the bay, with the result of obtaining navigation for vessels of six or seven feet draught,—an important acquisition to the inhabitants and summer visitors of the vicinity. In conclusion, the State Engineer said: "Personal observations made through a period of several weeks last summer convince me that the canal will not only restore the shell fisheries to their former condition, but that it will also materially aid in keeping open a channel connecting the Shinnecock bay with the ocean, should one be constructed in the future."⁹

When finished the canal was about four thousand feet long, forty feet wide on bottom, fifty-eight feet at water-surface, with a depth of four and a half feet at low tide. Although supposed to be completed, difficulties have since appeared which have necessitated an expenditure greater than the original cost. When the State Engineer reported the channel as finished, there was a part of the enterprise still under construction, but this was speedily completed. This work consisted in the construction of a swing-bridge to carry a highway across the canal near Shinnecock bay. In lieu of the locks suggested by Hutchinson and Seymour, this structure included a stop-gate between the piers of the bridge, which would allow the salt water to enter Shinnecock bay at high tide, but would prevent it from flowing back when the tide ebbed, thus avoiding the swift current and allowing boats to pass at high tide. However, soon after the completion of the bridge, the water, held back by the stop-gate, endangered the abutments by undermining the foundations and cut around through the approaches. A dam of piles and bags of sand was then built, to prevent further injury and to act as a temporary highway, and in 1893, under provision of chapter 726, a contract was awarded for restoring and protecting the bridge and approaches. This was done by driving long, tongued and grooved sheet-piling across the canal against the foundation and by placing rows of piles diagonally from the corners of abutments to the banks, with a filling of stone and sand at the approaches. At this time the stop-gate was removed.

In 1893 the State Engineer reported the permanent opening of the canal at a cost, thus far, of \$118,000, but indicated a source

⁹*Assembly Documents*, 1893, No. 35, p 28.

of future expenditure in recommending an appropriation for bank protection, saying: "The entire length of this canal was excavated through sand of a very light and unstable nature, and in order to secure a permanency to this channel, it will probably be necessary to protect its banks by piling for fully one-half of its whole length."¹⁰

Responding to the State Engineer's recommendations, the Legislature of 1894 enacted chapter 768, providing a fund of \$15,000 for piling and protecting the banks of the canal, also chapter 358, appropriating \$3,500 for the restoration and protection of the approaches to the swing-bridge over the canal. The work under these laws was begun during 1894, and consisted in driving a row of sheet piling along each side of the canal, to make the channel of uniform width from Shinnecock bay to the Long Island Railroad Company's bridge, and in adding a fixed span to the swing-bridge, thus giving the full width of waterway at that point.

In reporting progress in this year, the division engineer foreshadowed another source of large subsequent expenditure. Speaking of the railroad company's bridge, he said: "The abutments of this structure narrow the channel and forms an obstruction which greatly increases the velocity of the current at that point. The foundations are being undermined and they are in a very dangerous condition. When the tides are changing, during severe storms, these obstructions form cross-currents which tend to produce a scour into the shifting sands, causing changes in the courses of the channel. The abutments should be set back and the rows of sheet-piling continued as far as Conkling pond, thus giving a uniform width of channel the entire length of the canal."¹¹

The work of protecting the channel with sheet-piling, which had been begun in 1894, was completed in December of the same year, but at a considerably increased cost on account of a severe storm which occurred soon after the piling was finished in the vicinity of the railroad bridge. The waters had been driven through the contracted channel at the bridge with such force as to undermine and carry away much of the piling and to wash out

¹⁰*Assembly Documents*, 1894, No. 21, p. 39.

¹¹*Assembly Documents*, 1895, No. 89, p. 206.

the canal bottom to a depth of thirty feet, but the returning tides had filled it nearly to its normal condition. The break was repaired by driving triple-lap sheet-piling to a depth of forty feet.

It will be recalled that in 1893 the stop-gates had been removed from between the abutments of the swing-bridge. This resulted in lowering the water in Shinnecock bay about two and a-half feet and in eroding the banks and bottom of the canal by the strong tidal currents. To remedy this difficulty \$12,800 was appropriated in 1895 (chapter 932), supplemented by \$5,000 in 1896 (chapter 950), for constructing a set of automatic tide-gates. Under these provisions there were built five pairs of gates, supported on a platform of plank, which rested on piles. The gates spanned an opening of ninety-eight feet, with a navigable passage of twenty-eight feet and a depth of five feet on miter-sills at low water. The work was done with the water in the canal, and was completed in 1896, proving effective in restoring Shinnecock bay to its former height and thus stopping the damage that was being wrought to many hundred thousand dollars' worth of fine property bordering its shores, by the growth and decay of vegetation along the uncovered beach.

In 1895 another part of the project was authorized.¹² An inlet was directed to be cut between Shinnecock bay and the Atlantic ocean, so as to have a further beneficial effect on the fishing, oyster and clam industries, and to relieve the stagnant condition of the bay. The bay is separated from the ocean by a strip of land from one to two thousand feet wide, which is low and flat, excepting at the beach, where the dunes rise to an elevation of twenty to thirty feet above sea-level. A channel—thirty feet wide at bottom, six feet deep, with slopes of one on one and one-half—was cut through the low land to the foot of the dunes, about three hundred feet from the ocean. This had been excavated during 1896, with the intention of completing the cut in the spring, when the high water in the bay and a low tide in the ocean would produce a head of five or six feet to assist in opening the channel. When this was attempted, the neighboring inhabitants donated their services, as funds had been exhausted,

¹²Chapter 932, Laws of 1895, appropriating \$5,200, supplemented by chapter 950, Laws of 1896, providing \$5,000 for this inlet and the tide-gates.

but it proved a failure, the waves quickly forming the dunes again, so that few traces of the channel now remain.

In reporting the completion of these operations, the State Engineer said: "But one thing is now needed to complete this otherwise satisfactory job, and until it is done, the very life of the other work is seriously threatened.

"The Long Island Railroad Company's bridge now spans the canal just north of the tide gates. The present canal has an average width of 100 feet, while the clear width between the abutments of this bridge is only 40 feet. The effect of a northeast gale is to pile the waters against the north side of the bridge and then forcing it through the contracted channel between the bridge abutments, forms a whirlpool at this spot.

"The difference in elevation of the water surface between the northern and southern sides of the bridge, for a distance of about 60 feet, is sometimes as great as five feet, and the water rushes through with astonishing velocity, carrying with it all the sand in its course. The use of these abutments has long since been abandoned by the railroad company, and the present bridge rests on bearing piles exclusively. Immediately after such a storm, 42 feet of water has been found at this spot, and within four days thereafter this has been reduced to 17 feet, showing the extensive movement of sand by the scouring of water at this point. Except in the vicinity of this bridge, the waters of the canal at all stages and at all times are calm and tranquil, doing no damage to the bottom of the canal or its banks.

"Some means must be adopted soon for changing this bridge so as to leave the waterway under it of the same width as the balance of the canal, and it is hoped that the questions of liability and responsibility in connection with the bridge as between the State and the railroad company, which are now before the Board of Claims for adjudication, will be settled in time so that the present Legislature can adopt such means as may seem warranted under the circumstances for settling the present difficulty."¹³

In order to gain a more perfect understanding of the legal action brought by the railroad company against the State, it may be well to examine somewhat at length the circumstances attend-

¹³*Assembly Documents*, 1897, No. 73, pp. 30-31.

ing the building and the subsequent repairing and rebuilding of this bridge. When the canal was begun, this railroad was in operation. The excavation for the channel ran diagonally through the company's lands and under its tracks, and the State undertook the construction of a bridge. Owing to the topographic conditions at this point, the tracks had been laid upon an embankment ten feet high. The abutments were placed at the edges of the bottom excavation, or so as to give but forty feet clear width between them, thus narrowing the channel at this place. As previously stated, the current resulting from the tidal action and the contracted channel was exceedingly swift and strong and gradually it undermined the abutments of this bridge, till in 1892 it was condemned as unsafe by the railroad's engineers. Then appeal was made to the State authorities for relief, but, as no funds were available for such purpose, none was rendered. Thereupon, the company from its own funds strengthened and repaired the bridge at an expense of \$22,344.65. Suit being brought against the State in the Court of Claims for the recovery of this amount resulted in a judgment in favor of the company for \$21,470, which was paid.

The same conditions prevailing produced in 1899 a similar result and the bridge was again pronounced unsafe. The State Engineer also inspected the structure and confirmed the conclusion of the company's experts. A second appeal was made to the State for relief, but none being afforded the company in this emergency resolved again to undertake the work, but instead of repairing the old structure, to build a new bridge of greater span, setting the abutments back far enough to open an unobstructed channel. This determination was at once acted upon and the bridge was built, involving an expenditure of \$21,135.19. Before the actual work of construction was begun, the company submitted the plans and estimates of this new bridge to the State Engineer, who, they aver, approved them and sanctioned their execution. On April 22, 1900, the company filed a claim against the State in the Court of Claims for the amount expended in the construction of this bridge. This resulted in a judgment in favor of the State, dismissing the claim, May 22, 1902. Appeal from this judgment was taken by the company to the Appellate Division of the Supreme Court, Third Department,

notice of appeal being filed July 11, 1902. The case is still pending, nothing further having been done towards its final disposition.

There is little more to record concerning the canal except a few repairs and occasional dredging. In 1897, \$5,000 was appropriated (chapter 791) for repairing the tide-gates. Work was also done upon another channel leading from Shinnecock bay, which, although not directly connected with the Shinnecock and Peconic canal, may be regarded as a part of the same general scheme. The old channel between Shinnecock and Great South bays was not large enough to permit a free circulation of water between them—a condition which resulted in the waters of the upper end of Great South bay (called Quantuck bay at that end) becoming stagnant, and which threatened the destruction of the fish and oyster industries, as well as being a menace to health. A sum of \$20,000¹⁴ was appropriated for deepening and widening this passage, and by 1899 this had been accomplished, with the desired effect of remedying the sluggish condition of the water, benefiting the oyster industry and allowing freight and pleasure craft to enter either bay without difficulty. The channel was made thirty feet wide at bottom, five feet deep and with side slopes of one on one and one-half.

In reporting the condition of the tide-gates of the Shinnecock and Peconic canal in 1901, the State Engineer said: "In making repairs to these gates and their supporting platform and timbers during the present year, it was found that the timbers had been entirely destroyed by the teredo, which is active in these waters, and also that the plank platform has been freely undermined. It therefore became necessary either to abandon the works upon which \$195,500 had been expended since 1884, or to rebuild them in a thorough manner. To do this, it was necessary to place two coffer-dams across the canal and to build a concrete wall 10 feet deep below canal bottom with triple-lap sheet piles 20 feet deep to prevent undermining, and to build a concrete platform three feet thick and 22 feet wide, resting upon the tops of the piles which were embedded in the concrete; upon this to rebuild a framework and miter-sills supporting the tide-gates

¹⁴ \$5,000 by chapter 348, Laws of 1896, \$5,000 by chapter 790, Laws of 1897, and \$10,000 by chapter 207, Laws of 1898.

with creosoted timber, and to replace the tide-gates in good working order."¹⁸

When these repairs were begun in May, 1901, so extensive a change was not intended, but the exposure of the old gates, after coffer-dams had been built and the enclosed portion pumped out, revealed the ruin that had been wrought by the teredo, and an extra agreement was made with the contractor. Fortunately a sufficient sum had been appropriated (\$30,000 by chapter 419, Laws of 1900) and the work was completed in February, 1902, at a cost of \$16,569.76, thus leaving a substantial amount, which was subsequently expended by the Superintendent of Public Works in necessary dredging between the highway bridge and deep water in Shinnecock bay and from the piers to deep water in Peconic bay.

This canal is now successfully accomplishing the objects for which it was built. Since the channel at the railroad bridge has been made as large as the remaining prism, the trouble at that place has ceased. The piles and sheeting that were driven along the sides of the canal have been undermined and washed away; the banks have assumed a natural slope and, aside from occasional dredging, the waterway should serve its purpose, with few expenditures, for many years.

¹⁸*Assembly Documents*, 1902, No. 31, p. 42.

CHAPTER XIII.

SLIPS AND OTHER ADJUNCTS OF THE ERIE CANAL AT BUFFALO.

Historical accounts of the building, use and present condition of the Main and Hamburg and the Clark and Skinner canals, the Ohio slip and basin, the Prime, Commercial and Coit slips, the Evans ship canal, the Erie basin with its slips Nos. 1, 2 and 3 (now called Peacock, Erie and Niagara slips, respectively), and the City ship (formerly Blackwell) canal.

The need of a commodious harbor at the western terminus of the Erie canal was appreciated as soon as the canal itself was definitely located. In their report of February 17, 1817, before the construction of the Erie canal was authorized, the canal commissioners said: "It would be expedient to connect the west end of the great canal with the waters of Lake Erie, through the mouth of Buffalo creek. . . . It is important to have, at that end, a safe harbor, capable, without much expense, of sufficient enlargement for the accommodation of all boats and vessels, that a very extensive trade may hereafter require to enter and exchange their lading there."¹ In 1818 a law (chapter 120) was enacted ordering a survey and plan for a harbor at Buffalo creek, but its provisions do not seem to have been carried out. In 1819 another law (chapter 104) was passed, which empowered certain individuals to borrow twelve thousand dollars from the State to construct this harbor. By this law the commissioners were directed to have a survey made, which was done, with the result that the project was shown to be practicable, but, as the contest was then waging between Buffalo and Black Rock for the privilege of possessing the terminus of the canal, nothing more was done. In 1822, when this controversy was at its height, another act (chapter 251)

¹*Laus . . . in relation to the Erie and Champlain canals, etc.* Vol. I., p. 198.

offered to aid this company in building the harbor, and also promised a like assistance to the citizens of Black Rock in constructing a harbor at their village.

Eventually, there was opened in Buffalo a series of public and private slips or canals, which for many years formed important adjuncts to the main waterway and which in recent years have attracted considerable notice because of their stagnant and polluted waters. Soon after the completion of the Erie canal, it became clearly apparent that increased facilities were required to accommodate the transshipment of property between the canal and lake navigation and to provide stations or harbors at the City of Buffalo where vessels might remain when not in transit. The business of the canal soon reached such proportions that the great number of vessels engaged in traffic frequently congested the waterways terminating at Buffalo, causing vexatious delays and consequent pecuniary loss to boatmen and merchants. The first effort to eliminate this difficulty was made at individual expense. We find a record of the contract for one canal being let as early as 1831. By 1833 the common council of Buffalo had taken steps to increase terminal facilities, for the city records show that an estimate for the Main and Hamburg canal had been prepared in that year, that in 1835 land had been acquired and that a contract had been let in 1836. Four years later the State undertook the completion of one canal, which the city had begun, and subsequently of others, so that eventually, by private, municipal and State enterprise, there was built an important system of short street canals or slips, connecting the Erie canal with Buffalo creek and Lake Erie. These canals were the Main and Hamburg and the Clark and Skinner canals, the Ohio slip and basin, the Prime, Commercial and Coit slips, the Evans ship canal, the Erie basin, slips Nos. 1, 2 and 3, the City ship canal and several smaller branches of these main channels, which have not been dignified with a name. Of these the largest was the Main and Hamburg, being about one mile in length, extending from Hamburg street in a westerly direction to Main street, where it formed a junction with and became virtually an extension of the Erie canal. From Hamburg street it extended to the Hydraulic canal. As designed, it was one hundred feet wide and was to be excavated seven feet. The Clark and

Skinner canal connected the Main and Hamburg with Buffalo creek and was 0.33 mile in length. Ohio slip joined the Main and Hamburg with the commodious Ohio basin, forming its southern terminus, which was connected with Buffalo creek by a short outlet. The slip was about one-half mile and the basin about one-fifth of a mile long. Prime and Commercial slips connected the Erie canal with Buffalo creek and were each about one-eighth of a mile long. Evans slip joins Buffalo creek with Slip No. 1, which connects the Erie canal with the Erie basin, as do slips Nos. 2 and 3, the latter three slips being, respectively, 0.19, 0.11 and 0.09 mile in length. Coit slip is a *cul de sac*, running easterly from Erie basin. The City ship canal extends southeasterly from the mouth of Buffalo creek between the creek and the lake shore.

EARLY HISTORY.

MAIN AND HAMBURG CANAL.

As previously stated, the City of Buffalo had begun operations on the Main and Hamburg canal, but the question having arisen as to the city's authority to undertake such work, application was made to the Legislature of 1838, which enacted chapter 116, authorizing the common council "to assess upon the real estate in said city to be benefited thereby the expenses of constructing a canal laid out by them from Main and Hamburg street and hence to the Hydraulic canal in said city."

In designing the construction of these various canals, it was expected that sooner or later their control if not their construction would be assumed by the State. Before much had been accomplished by the city, the attention of the Legislature was called to the project by petition and otherwise, and on April 19, 1839, that body adopted a concurrent resolution directing the canal commissioners to cause surveys and estimates to be made and to report on the advisability of the State's assumption and completion of the Main and Hamburg canal. As a result of the survey the commissioners reported to the Legislature at its next session in favor of granting the prayer of the petitioners. The Legislature of that year acted promptly and, by the provisions of chapter 307, authorized the canal board to

complete the construction of the Main and Hamburg canal and to pay to the city of Buffalo all disbursements on account thereof, provided the common council should deliver to the State releases of the premises occupied by the canal. In accordance with the provisions of this act the sum of \$12,000 was paid to the City of Buffalo, this being the amount thus far disbursed by the city in the construction of the canal. In 1841 the city deeded the lands to the State, and in 1843 the canal board ordered the construction of the Main and Hamburg canal as far as the Clark and Skinner canal, about one-third of the distance, the Clark and Skinner also having been adopted and completed by the board as an extraordinary repair in that year.

Nothing further toward completing the construction of the Main and Hamburg canal appears to have been accomplished for several years. On September 27, 1847, the canal board, responding to a request of the Assembly, rendered a report in relation to divers petitions, addressed to the Legislature by citizens and the common council of the City of Buffalo, and praying for certain improvements to the Erie canal and its adjuncts, existing and proposed. It appears from this report,² that seven members of the canal board, upon the invitation of the municipal authorities, visited the City of Buffalo and examined the plans and inspected the localities where these improvements were designed to be made. As a result the commissioners were unanimously agreed that these works were necessary and that adequate appropriations should be made by the State. The improvements indicated by the commissioners were: first, the immediate completion of the Main and Hamburg canal; second, the construction of the Ohio slip and basin, the basin to cover an area of ten acres and to be sufficiently deep to accommodate lake vessels; third, the connection of the Erie canal and Buffalo creek near its mouth by a ship canal, one-half mile long, three hundred feet wide and of sufficient depth to accommodate lake vessels. This connection was to be made by slips Nos. 1, 2 and 3, running from the Erie canal to the ship canal, or Erie basin, as it was called thereafter.

In June, 1848, the construction of the Main and Hamburg canal was put under contract, to be completed in August, 1849.

²*Assembly Documents*, 1847, No. 205.

The work progressed favorably and in all probability would have been completed according to contract but for the advent of an epidemic of cholera in July, 1849. The board of health of Buffalo, deeming the existence of the freshly opened canal ditch a menace to public health and likely to increase the virulence of the plague, ordered further operations suspended and the trench to be flooded. On November 2, following, the work was relet, to be finished in June, 1850. By the close of 1849 the canal had been excavated as far as Michigan street, about one-third of the distance. It was finished in 1851 but too late to be of service that year, being filled and brought into use at the opening of the season of navigation in the spring of 1852.

CLARK AND SKINNER CANAL.

The Clark and Skinner canal was commenced by individual effort and subsequently adopted by the State. On April 18, 1843, the canal board directed the canal commissioner of the western division to complete and improve the Clark and Skinner slip, provided the common council of the City of Buffalo should give releases covering the premises occupied by the canal. The commissioners proceeded with the excavations, but neglected to procure the precedent releases. From that time forward the State continued in possession of the Clark and Skinner canal, operating it and improving it occasionally.

In 1862 the canal board received a petition signed by many prominent business firms and citizens of Buffalo, calling attention to the fact that the Clark and Skinner canal had become nearly useless by reason of the falling in of the banks and the deposits in the bottom. The petition, referring to the importance and usefulness of the canal, prayed that the channel might be dredged and docked with stone as soon as possible. This petition was referred to the three canal commissioners, who reported, saying: "That, on investigation, they find said canal extends from the Main and Hamburg canal to Big Buffalo creek, and that it is the only canal or slip connecting with said creek between Commercial and Ohio Basin slips; that it is a very important channel, and should be placed in serviceable condition.

"They find that said canal was constructed in the year 1843, by the city of Buffalo; that it is 43 feet in width, and that no

record of its transfer to the State can be found; that a street has been laid out on the westerly side of said canal 40 feet in width, and that a large part of said street has slid into the canal.

"That the State has constructed several bridges across said canal, and that they are built about 55 feet in length, and that to make the canal a useful and important thoroughfare, it should be at least 58 feet in width; that to accomplish this purpose, this committee have procured a conveyance from the city of Buffalo to the State of New York, of the said Clark and Skinner canal, and releases to the State from all holders of real estate bordering on said street, of so much of said street as the State may see fit to appropriate.

"The committee, therefore, recommend the adoption of the following resolution:

"*Resolved*, That the Canal Board for the State of New York do hereby accept of the grant from the city of Buffalo, conveying the Clark and Skinner canal to the State; that they accept of the releases of the rights and interests of the property holders on Liberty street to said street.

"That this Board, in pursuance of such grant and releases, do hereby accept the said Clark and Skinner canal, in the city of Buffalo, and so much of said Liberty street as may be necessary to make such canal fifty-eight feet in width, in accordance with the map attached hereto."³

At a meeting of the canal board held shortly thereafter, on December 11, 1862, the Attorney-General made an adverse verbal report against this resolution, on the ground that the board had not jurisdiction or power to act upon the subject. On the following day the canal board again met and resolved that the whole matter be laid before the Legislature early in the coming session. The Legislature gave the subject prompt attention and on March 23, 1863, enacted chapter 40, authorizing the canal board to accept conveyance to the State of the Clark and Skinner canal and directing the common council of the City of Buffalo to convey the same.

³*Senate Documents*, 1863, No. 16, pp. 3-4.

ERIE BASIN, SLIPS NOS. 1, 2 AND 3, OHIO SLIP AND BASIN.

The Erie and Ohio basins, with their connecting slips, were provided for by chapter 445, Laws of 1847, which made appropriation for their construction. The following year chapter 213 made an additional appropriation for the same purpose. The canal board having determined upon the utility of the proposed works and the necessary appropriations having been made, the canal commissioners took immediate measures to secure the consummation of the project. A deed was executed by the City of Buffalo, conveying to the State the lands necessary for the construction of the basins. The Ohio basin and slip were put under contract July 14, 1848, and the Erie basin and slips, August 14, 1848. The former basin, when completed, was to comprise an area of ten acres, and the latter, eighteen acres. Work was energetically prosecuted and up to January 31, 1849, the sum of \$6,510 had been expended in the construction of the Ohio basin and \$8,296 on the Erie basin.

After the contracts had been made and the work of construction entered upon, the canal board was appraised of the fact that the land conveyed to the State by the City of Buffalo for these basins had not been paid for in full. The matter having been submitted to the Attorney-General, that official verbally reported to the board that the title to the lands designated for the sites of the basins would not be vested in the State until the owners thereof had been fully compensated. Whereupon the canal board, being convinced that the owners had not been so compensated, resolved: "That the Canal Commissioners be advised by this Board not to expend any further moneys upon or towards the construction of said basins respectively, until said lands for the respective sites thereof, shall have been actually paid for by said city; and that they suspend all further operations on said basins respectively, unless such lands be paid for by said city within thirty days after a copy of this resolution shall have been forwarded by mail to the mayor or common council of said city, or such further time as the Commissioners may deem reasonable."⁴

As the canal board was of the opinion that some alterations should be made in the construction of the Erie basin, the Legis-

⁴*Senate Documents*, 1849, No. 26, p. 4.

lature by the enactment of chapter 234, Laws of 1849, conferred the necessary authority, directing the board to make such change or alteration in the location or dimensions of a portion of the basin as in their opinion would best subserve the interests of the State, upon condition that the common council of Buffalo should agree to the same and convey to the State all lands necessary for the purpose. The law also gave the canal board power to cancel the contract, after settling with the contractors for work already done.

The Erie basin and the three connecting slips were again advertised on a plan approved by the canal board, and were put under contract for the second time in February, 1850, and work was begun in the spring of that year. The change of location materially increased the area without adding to the cost of constructing the basin, and also secured the additional advantage of allowing the basin to be increased in the future to any desirable extent commensurate with the requirements of commerce. In 1850 a breakwater, designed for the protection of the basin, was built to the surface of the water for a distance of eighteen hundred feet, leaving about three hundred feet to be constructed. Some eight hundred cubic yards of cement masonry were laid during that year, the wall being six feet wide and about six feet high, but in the spring of 1851 several hundred yards of this masonry were broken to pieces and swept from their foundation by the severe storms of the lake. The canal board subsequently changed the plan of construction by increasing the dimensions of the sea-wall and by providing for a continuous crib outside of the piles so as to break the force of the waves before they could reach the wall. In the summer of 1851, when the channel was partially protected by the breakwater, the dredging of the basin was commenced. During the same year one slip was excavated, cribbed and brought into use and the completion of the two others promised for the following summer.

Speaking of the Erie basin and slips in their report for 1856, the canal commissioners said: "Several changes in the plan of construction have been made by the Canal Board, largely increasing the cost of the work; during the past year it has been prosecuted principally upon the change of plan adopted in 1855, with the exception of the channel excavation, and is now so

far advanced that it may be fully completed by the spring of 1858.”^a

From the annual report of the canal commissioners for 1857 we learn that the contract for the construction of the Erie basin and slips, not having been prosecuted as required, was declared abandoned December 29, 1857. The work was soon advertised to be relet. In this report the commissioners said further: “The expenditures upon this work the past season have been confined mainly to the breakwater, which was extended to the length designed, the masonry built and partially protected in the rear with piles and loose stone, but not to the extent required by the contract, and during the gale on the first of November last [1857], a portion of it was broken down, which leaves the balance of the wall between that and the northern termination, a distance of about 150 feet, much exposed and liable to be carried away before the season will admit of its being secured. The work remaining to be done so far as contemplated under the present plan, consists of rebuilding such portions of the masonry as may be found necessary, finishing the outside protection to the break-water, completing the channel excavation, a large portion of which has already been done, removing the deposits from slip No. 3, and building a pier to protect the entrance to said slip.”^b

In 1861, the canal commissioners in their annual report for the preceding year said of the Erie basin and slips, that under the contract of February, 1850, up to 1857, when the work was abandoned, “work to the amount of \$295,608 was done.” Continuing, they said: “On the 4th of March, 1858, the work was again put under contract . . . and has progressed to the present time, except when suspended for want of funds. Under this last contract, work, by the estimates, to the amount of \$63,455, has been done. Owing to the limited amount of funds that could be applied to this work, the expenditures, under the last contract, have been confined to the breakwater. . . . It is estimated that \$4,180 more will complete the breakwater, which will make the whole expenditure upon the work, \$363,248. There will then remain to be done, to complete the whole work

^a*Assembly Documents*, 1857, No. 145, p. 150.

^b*Assembly Documents*, 1858, No. 20, pp. 152-153.

according to the original plan, the finishing of the 'Jetty pier,' . . . and the reconstruction and finishing of the docking around slip No. 3 and its vicinity. To finish pier and docking will cost, according to the estimates, \$18,411.

"Though there may be differences of opinion as to the original policy of embarking on this extensive work, involving, as it has, so large an outlay, it is believed there can be no difference as to the policy of now completing it substantially in accordance with the original plan. It is an important work, furnishing a harbor for lake and canal craft, and a convenient and important connection between lake and canal commerce.

"The 'Jetty pier,' at the lower side of the basin, is designed, and is important, to protect the basin and slip No. 3, and the canal (if the slip is kept open), from the heavy swells and accumulation of sand from the lake and river. It is believed that, unless the pier is completed, the basin will, in a few years, be very much obstructed by sand and other deposits. Piles have been driven for the pier, and a small part of the crib work has been done."

In the year following the commissioners reported: "But little has been done within the present year. Since the last report the canal board has ordered the plan of construction of the jetty pier to be changed by substituting stone masonry for timber, the estimated cost of which is \$16,570."⁸

The jetty pier in the Erie basin was, with the exception of coping stones, completed in September, 1862.

It was the intention of the authorities, when the construction of the Erie basin was decided upon, to excavate the earth therefrom in a channel three hundred feet wide to the depth of twelve feet for the purpose of permitting vessels and canal-boats to exchange their cargoes in the basin. A contract was entered into for this purpose, but before it could be completed, the work was suspended by the operation of chapter 169, Laws of 1862, which prohibited further expenditure on this as well as on most of the canals of the state.

The canal commissioners, speaking of this necessary improvement in 1864, say in their annual report: "A large portion of

⁷*Assembly Documents*, 1861, No. 57, pp. 87-88.

⁸*Senate Documents*, 1862, No. 26.

the land used in the basin was donated by the city of Buffalo with the understanding that important improvements were to be made. The large amount of harbor room now occupied by canal boats to the detriment of vessels renders the pending improvement now of great importance. No dredging has ever been done by the State and to make a channel as contemplated and contracted for under the enlargement would require the removal of 60,000 yards of material at an estimated cost of \$18,000."

At a meeting of the common council of Buffalo, held February 28, 1853, the names of slips Nos. 1, 2 and 3 were changed by resolution to Peacock, Erie and Niagara slips, respectively.

Not much difficulty appears to have been encountered in constructing the Ohio slip and basin. The slip was completed in 1850, and the basin in 1851.

EVANS SHIP CANAL.

One of the most important and useful of the many slips or street canals at Buffalo is Evans slip. It was constructed entirely by the Evans estate. The contract for its construction was advertised and let in 1831; work was commenced the year following and the canal entirely completed two years thereafter, or during the year 1834. For many years the slip was known as the Ship canal, but as this designation was provocative of confusion, owing to its resemblance to the city ship canal, it eventually led to the adoption of the following resolution by the common council in 1853, when the names of some other slips were also changed:

*"Resolved, That it be and is hereby ordered and determined that the ship canal lying west of Norton street and heretofore known as the Ship canal be hereafter known and designated as Evans Ship Canal."*¹⁰

COMMERCIAL, PRIME AND COIT SLIPS.

Probably Commercial slip was constructed by the State at the time of building the Erie, in forming the connecting link between the canal and Buffalo harbor, or Buffalo creek, as it was called in the early days. It is shown inclosed within the "blue line"

¹⁰*Assembly Documents*, 1865, No. 10.

¹¹*Manuscript Minutes of Buffalo Common Council*, p. 554.

and designated simply as a "basin" on the first official map of the State canals, the surveys for which were begun soon after the completion of the Erie, this portion, however, not being surveyed until the autumn of 1833. The records show that the State has done some work in the slip from time to time, chiefly in dredging the channel.

Prime slip—a canal forty feet wide—was opened by private enterprise at an early date. It is shown on the map just mentioned with the name "Thompson's cut." It remained under private control during its entire existence, as was evidenced when the city undertook to fill in the channel, as we shall see presently.

Coit slip was built at private expense and has never been acquired by the State or city.

CITY SHIP CANAL.

The City ship canal, originally known and officially designated as the E. R. Blackwell canal, was laid out by the City of Buffalo on the southerly side of Buffalo creek. Commencing at a point near the old lighthouse, it extended to the south channel and was connected with the Buffalo creek by a number of short slips or street canals. Being two hundred feet wide and twelve feet deep, it proved to be a very important acquisition to the Erie canal.

The City ship canal was projected as early as 1836, but no definite action presaging actual construction was taken until 1847; when initiatory proceedings to acquire title to the necessary land by condemnatory measures were instituted. Commissioners having been duly appointed to appraise the damages for land appropriated, and their report of February 6, 1849, having been confirmed without delay, the common council of Buffalo directed the city surveyor and the street commissioner to make surveys, estimates, etc., for the proposed canal. These officials reported to the council in March of the same year, estimating the probable cost at \$61,000. As is usual in cases of proposed public improvements, some remonstrance was expressed in the press and otherwise, but despite this opposition the contract was promptly awarded to E. R. Blackwell and the work of construction actively prosecuted. Early in 1850 it became apparent that the estimate of cost had been entirely too low. The construction of the south-

ern half of the canal alone had necessitated an outlay of about \$73,000. The existing contract with Mr. Blackwell was canceled and a new one, based on revised estimates, was made with the same contractor, the canal being completed and brought into use during the same year—1850.

In 1853, when the names of some of the other slips were changed, the name originally conferred upon this channel—E. R. Blackwell canal—was also changed by resolution of the council and thereafter it became known by its present title—City ship canal.

In 1873 by direction of the municipal authorities, it was improved, being made one hundred and forty feet wide and fifteen feet deep. In 1883 the Buffalo Creek Railway Company applied for and obtained permission to extend the canal in a southerly direction into its own lands. This portion is now occupied by the Lehigh Valley Railroad coal docks.

LATER HISTORY.

For years the slips and basins amply and well subserved the purposes for which they were constructed, but, despite their unquestioned value, some of them were destined to become a source of trouble and annoyance to the residents in their neighborhood. These slips, together with the Erie canal, extended along the greater part of Buffalo's lake front, and thus became the receptacles for much of the sewage from the city.

The Main and Hamburg slip, the most important of the street canals, by reason of its position became the most troublesome. Being devoid of current, it was declared a nuisance as early as 1855. From that time frequent and costly attempts were made to create a current, and thousands of dollars were expended by the city in operating pumps, wheels and curious mechanical devices to produce this result, but without success. Among the devices adopted to abate this nuisance may be mentioned the following: a ditch to Little Buffalo creek (1855), the introduction of a current of water from Big Buffalo creek (1869), the construction of a trunk sewer and the extension of the canal to Buffalo river (1870), the establishment and operation of a stationary tug in the canal (1877), the erection of a series of gates in the canal and the construction of a dam across Black

Rock harbor, the boring of artesian wells and finally a return to the trunk sewer plan (1880). However, all efforts proved unavailing; the desired current was not permanently established and the nuisance successfully resisted every attempt at elimination. Finally it was seen that the channel must be filled, and in 1894 the State Constitution was so amended as to exempt this canal from the provision which prohibited the lease, sale or other disposition of the State canals.

In his report for 1896, the western division engineer gave a description of the condition of the canal at that time, together with a short account of the increasing trouble. He said:-

"The State, with little or no restrictions, has allowed the city of Buffalo and its citizens to empty sewage into the Hamburg and Erie canals. The Erie canal, because of its situation and because of its constant use for navigation purposes, is not so badly polluted as the Hamburg and its slips. The Hamburg canal, situated as it is, has no current, and has not for a number of years been used for navigation, and has become nothing more than a stagnant body of water into which a large amount of Buffalo's drainage empties.

"The Hamburg canal was built in 1846, and as early as 1855 attempts were made to abate the nuisance it then created. From that time until 1882 various plans were tried to create a current in the canal and thus cleanse it; but none were successful. In 1882 Col. G. E. Waring proposed to relieve the difficulty by constructing an intercepting sewer, running generally parallel to the Hamburg and Erie canals and emptying into the Niagara river near Ferry street.

"The sewer was built, but proved a failure, either from faulty construction or design, and the condition of the Hamburg is as bad now as it ever was. For the last few years the city has been spending \$6,000 per year operating pumps and wheels to create a current. The current, however, is not apparent."¹¹

In view of the great importance to both city and State of abating this nuisance, the division engineer presented plans and estimates for this purpose in this same report. His proposition was to build sewers in the Main and Hamburg and the Clark

¹¹*Assembly Documents*, 1897, No. 73, pp. 580-581.

and Skinner canals with an outlet at the junction of the latter with Buffalo creek, where a gate was to be placed, so that the sewer could be pumped out and cleaned. He proposed also to fill in these canals, together with that portion of the Ohio slip lying north of Elk street, estimating the whole cost at \$389,000. He declared that the adoption of this plan would reclaim about twenty-three acres of land occupied by the canals and estimated to be worth over a million dollars, that the sanitary condition of 3,640 acres would be vastly improved, and that the maintenance of ten bridges would be obviated, saying that the canals thus to be abandoned were practically of no use for navigation. He suggested three methods for carrying out his plan: first, that the State should do the work and then dispose of the reclaimed land; second, that the State should give the canals to Buffalo on condition that the city should do the work; third, that the canal should be sold to the highest bidder on the same condition.

The Legislature practically adopted a course corresponding to the second suggestion. In 1898 an act (chapter 295) authorized the abandonment of the Main and Hamburg canal and its conveyance to Buffalo upon condition that the city fill in the prism, abate the nuisance and save the State harmless from all damage. In 1899 an act (chapter 578) empowered Buffalo to sell this canal, and another (chapter 579) authorized the city to raise \$550,000 for the purpose of filling the channel and abating the nuisance. Another law of this year (chapter 663) provided that no corporation could take this canal by the right of eminent domain.

In his annual report in 1901, the western division engineer described the subsequent action of the city. He said:

“The State has abandoned the Hamburg canal to the City of Buffalo, which is constructing a large overflow sewer from the Hamburg sewer in same and filling-in the prism. The Ohio Basin slip and Clark and Skinner canals extend from the Hamburg canal to the Buffalo river, and the closing of the Hamburg has stopped what little current formerly existed in them. Sewage and other refuse deposited in these two slips is rapidly filling up the channels and rendering them foul. The City of Buffalo is constructing a branch from the sewer in the Ham-

burg canal, to empty into the Ohio Basin slip. The usefulness of these slips for navigation has probably passed, and they should either be filled in and remove the necessity of rebuilding the now obsolete bridges carrying the streets over them, or some means provided of preventing them from becoming nuisances."¹²

In 1901, by chapter 651, the portion of the Ohio slip north of Elk street was abandoned and conveyed to Buffalo upon the same conditions mentioned in connection with the transfer of the Main and Hamburg canal.

When the attempt was made to transfer the Clark and Skinner canal to the city in like manner, the fact was brought to light that a clear title to the land had not been obtained at the time of its construction. By an oversight, it seems, in procuring the necessary land for the canal in 1843, the city obtained a mere easement, as no precedent power to acquire the fee had been conferred by the Legislature. This untoward circumstance led to considerable trouble and expense more than half a century later. It will be remembered that in June, 1862, the mayor and city clerk of Buffalo, having been duly authorized, executed a deed conveying this canal to the State.

On December 31, 1901, the canal board abandoned the Clark and Skinner canal. Upon being notified of this action, the mayor, common council and corporation council of Buffalo immediately took steps to acquire the canal, forwarding to their legislative delegation at Albany two proposed enactments—one to confer the title upon the city on condition that the municipality should abate the nuisance, and the other to authorize the raising of \$100,000 for this purpose. The act to raise the money was passed and became chapter 461 of the laws of 1902. The measure to cede the title to the city passed the Assembly but failed in the Senate, on the ground that the commissioners of the land office were the proper officials to dispose of the canal. Thereupon the city authorities applied to the commissioners of the land office, requesting that the title to the canal be granted to the city upon condition of its removing the nuisance. At this time the city was made aware of the fact that a private corporation—a cold storage company—had also made

¹²*Assembly Documents*, 1902, No. 31, p. 309.

offers for acquiring this title. A committee of officials representing the city was appointed to wait upon the commissioners, and its request was granted for a reasonable delay before final action should be taken.

Meanwhile the city was legally informed that by its right of eminent domain the New York, Lackawanna and Western Railway Company had taken steps to obtain title to the canal lying between Elk and Perry streets, the portion situated in front of its property. The commissioners appointed by the Supreme Court in these proceedings appraised the damages due to the State at \$7,488.19, while to the city they awarded merely nominal damages. This award was duly confirmed by the Supreme Court at Special Term.

In 1903, by chapter 535, Buffalo was authorized to raise \$100,000 for abating the nuisance and filling the prism of this canal, in the event of its acquiring the title. In the next year a successful appeal was made to the Legislature and an act (chapter 565) conferred upon the city the titles to the remaining portions of the Clark and Skinner canal and also to Liberty street—a strip forty feet wide, adjoining the canal and extending its entire length. This act also enabled the city to build sewers in the canal and street.

Prime slip suffered the same experience with respect to its ultimate sanitary condition. As early as 1865 it was officially declared a public nuisance and ordered to be filled. In the summer of the following year a number of actions were brought against the City of Buffalo, praying that it be restrained from filling this slip. Several of these actions were brought to trial in the Superior Court in January, 1867, notably that of *George G. Babcock vs. The City of Buffalo*. The plaintiff was an owner of land adjoining the slip and sought to restrain the city from filling the canal and requiring it to remove the filling already placed therein. The issues in the action were submitted February 4, 1867, and resulted in a decision favorable to the interests of the city. Babcock appealed to the General Term of the Superior Court, which reversed the judgment of the court below and rendered judgment for the plaintiff, perpetually enjoining the city from filling the slip. The city carried the case to the Court of Appeals which affirmed the order of the General Term

and directed the city to remove the filling from the canal in front of the plaintiff's premises. Finally after much local legislation by the common council, ordering the reopening of the slip, the city effected compromises with the property owners.

Before describing the present condition of these various slips and canals, it may be well to briefly mention a structure which was made necessary by the polluted condition of these waters. In 1867 the western division canal commissioner said in his annual report: "It has also been suggested, by the Engineer Department, that a jetty pier be constructed, above the arm of the main pier, for the purpose of throwing out, in the Niagara river, the sewage and other debris from the city, which have been rapidly filling up Black Rock harbor."¹³

This proposed pier was to be placed at the foot of York street; it was to be seven hundred feet long and was estimated to cost \$7,500. The Legislature of 1868, responding to the recommendations of the commissioner, enacted chapter 715, among the items of which was one of \$7,000 for the construction of a pile jetty pier at the southerly end of the Black Rock harbor. The pier was completed during the fiscal year ending September 30, 1870.

PRESENT CONDITION.

The Main and Hamburg canal has been filled throughout its entire length, and recently it was sold by the City of Buffalo to Messrs. Lee, Higginson & Co., the Boston, Mass., capitalists, acting as agents for the Wabash Railroad Company, for the sum of \$901,000. The sum realized by the city through this sale was, by resolution of the common council, created a fund to be known as the Canal Nuisance Abatement Sinking Fund. This fund is to be set apart and held for the redemption of the bonds floated in aid of the construction of sewers and the abatement of nuisances in the Main and Hamburg, Clark and Skinner and Ohio slips.

The Clark and Skinner canal is open between Perry and Scott streets, about one-third of its extent, and has been filled between Perry and Ohio streets—the remaining section. The New York Lackawanna and Western Railroad Company, owner of that por-

¹³*Assembly Documents*, 1868, No. 9, p. 124.

tion of the canal lying between Perry and Elk streets, has erected thereon a fine, commodious freight depot. The sewer mentioned in chapter 565, Laws of 1904, is in course of construction.

The Ohio slip has been filled in as far south as Elk street and lies open beyond that point.

Prime slip as has been recorded was filled in with solid material during the late 'sixties.

Erie basin and its three connecting slips, Peacock, Erie and Niagara (formerly called slips Nos. 1, 2 and 3, respectively), are still open.

Evans ship canal, Commercial and Coit slips and the City ship canal are all similarly open to the uses which suggested and brought about their construction.

CHAPTER XIV.

THE CHEMUNG CANAL.

From the early inception of this route to join the natural streams of New York and Pennsylvania to the abandonment of the canal.

At an early day the proximity of the Chemung river and the head waters of Seneca lake gave rise to plans for connecting the navigable streams of New York with those of Pennsylvania by an artificial waterway. During his expedition against the Six Nations of Indians in 1779, General Sullivan addressed a letter to General Washington, who was a strong advocate of canals, on the subject of uniting the northern and southern waters. General Washington presented the matter to the consideration of Congress, but without result.

The first account of legislative notice in New York is found in a letter of March 4, 1792, from General Philip Schuyler, in which he describes the action taken on a bill for incorporating the Western Inland Lock Navigation Company. He said: "A clause was proposed for preventing any canals to the Susquehannah, but it was lost: it being conceived improper to oblige the inhabitants of the western country to make Hudson's river, or the commercial towns on it, the only markets."¹

This region had become well populated several years after General Sullivan's operations against the Indians. The General led his army into Chemung county from the south by way of the Chemung river. He was so impressed with the country, and upon his return to Pennsylvania, he gave such glowing accounts of the fertility and beauty of the valley, that in 1787 immigrants from that state flocked to Chemung county in large numbers.

As early as 1812 the contemplated route was explored by James Geddes, under the direction of the board of canal commissioners, and he reported favorably upon the practicability of constructing a navigable communication on that route. In 1824 the Assembly

¹Watson's *History . . . of the Western Canals*, p. 35.

committee on canals reported that later an exploration was made by two citizens of New York State, and also by commissioners and engineers appointed by the Governor of the State of Pennsylvania and that their opinions coincided with the report submitted to the canal commissioners by Mr. Geddes.

In 1815 the people residing in western New York became interested in the construction of a canal over this route, believing that such means of navigation would be an object of great public utility, by affording an avenue for conveying by water to the interior of Pennsylvania great quantities of salt, made in their localities, and plaster of paris, found in great abundance in the county of Seneca. The exportation of these articles was considered a source of much wealth to the people interested, and so important was the making of this water connection regarded, that private enterprise was aroused to effect the object. Consequently in 1815, a petition was presented to the Legislature by a body of men desiring to be incorporated under the name of "The Seneca and Susquehannah Lock Navigation Company," with a capital of three hundred thousand dollars, for the purpose of connecting the head waters of Seneca lake with the waters of the Chemung river, a branch of the Susquehanna at or near the village of Newtown, in the county of Tioga.² In 1813 the Seneca Lock Navigation Company had been incorporated for the purpose of opening navigation between Seneca and Cayuga lakes. Through the completion of this canal and the opening of the Chemung route the waterways of New York and Pennsylvania would be united.

The wishes of the petitioners were acceded to by the enactment of chapter 125, which specified that the capital stock of the company should consist of six thousand shares, of fifty dollars each, and fixed the dimensions of the canal at not less than twelve feet in width at the bottom of the prism, and the size of the locks at not less than seventy feet in length between the gates. The act also stipulated that unless the canal should be built within fourteen years the law would become void. The company, however, never carried out the purposes for which it was incorporated and the people, who had looked so hopefully towards the construction of the canal, were greatly disappointed.

² In 1826 Chemung County was formed from a part of Tioga County.

In 1819, Governor Clinton, in his annual message to the Legislature, alluded to the feasibility of constructing a canal over this route. This speech, together with the growing popularity of the Erie canal, and the recognized need of some connection with the waters of the south, was responsible for the many petitions which deluged the Legislature in succeeding years, asking the State to undertake the works. Up to 1824 bills were annually introduced, but received the sanction of only one branch of the Legislature. The Assembly committee of this year, in reporting on petitions asking for legislative aid, said in reference to the construction of the canal:—

“The interest which this state has in executing this important work . . . arises from the following considerations. Its completion would extend our salt market to the supply of the vast extent of country bordering on the shores of the Susquehannah, and the tributary navigable streams to that river, and of a considerable portion of the State of Maryland, to the amount annually of 450,000 bushels; whereas the *expense* of transportation *now*, prevents the successful introduction of our salt trade, to any considerable extent in those states, by which alone an increase of revenue would be acquired, to the amount of \$56,250 over and above the tolls, which would result from the use of this highly interesting and important public improvement; and when the contemplated canal navigations in those states^{*} shall be completed, we may expect, with the great facilities and reduced expense thus rendered, of landing our salt in their markets generally to exclude foreign competition. Our western plaster will supply more cheaply the shores of the Susquehannah, and its many navigable tributaries; coal, from the extensive mines in the vicinity of the navigable waters of the Tioga river, will, by means of this facility of transportation, furnish a cheap fuel for our manufactories and cities. The produce of an extensive and fertile district of country, which is now carried to southern markets, will, by the proposed navigation, receive a new direction to the Erie canal, and while seeking a market on the shores of the Hudson, or in the great commercial emporium of our country, its transportation will add a large amount to the receipts

^{*} Pennsylvania and Maryland.

from the tolls of the grand canal, and at the same time present a new channel to the enterprize of a respectable portion of our commercial citizens. By all which the state, while it will justly claim the honor of connecting, by direct navigation, the western and northern lakes, with the waters of the Susquehannah and Chesapeake, will insure to itself a large increase of revenue, and to the citizens of the district, through which the canal is to be made, a participation in the benefits of our grand system of internal improvements."⁴

While the committee did not feel disposed to advise that at that time any portion of the public funds should be diverted from the Erie canal, which was then in process of construction, yet the great importance of the proposed work impelled the committee to introduce a resolution recommending that the canal commissioners be required to procure, by the aid of a competent engineer, a survey of a canal route and an estimate of the expense of constructing a canal to connect Seneca lake with the Tioga or Susquehanna rivers, and to report at the next session of the Legislature. The resolution was adopted by the House, but was never acted upon by the Senate.

In 1825 the subject of general investigation for lateral routes came before the Legislature and an act (chapter 236) was passed, providing for examinations, surveys and estimates to be made of several canal routes, which included one from Seneca lake to the Chemung river,⁵ at or near the village of Newtown, the same points which the Seneca and Susquehanna Lock Navigation Company proposed to connect in 1815.

The survey was made by Mr. Geddes, who had examined this route in 1812. In his report in 1826 he said that "to make the communication required, a canal should be constructed from Seneca lake to Newtown, eighteen miles, and a navigable feeder from the Chimney Narrows, on the Chemung river, to the summit level of the canal, thirteen miles, making a navigation by canal of thirty-one miles." He also reported that the feeder would encounter some distance of high, steep, gravel bank before it could leave the river shore. Below this high bank the Big flats

⁴*Assembly Journal*, 1824, p. 743.

⁵Also called Tioga river, but was officially announced in the act as Chemung river.

commenced, along which the canal could be conducted on favorable ground until after it crossed the valley of Singing creek. Here began a piece of deep cutting something over a mile and one-half in length. The ridge to be cut through at this place appeared from wells in the vicinity to be of clay for a depth far below the proposed bottom of the canal. For nearly half a mile the highest part would necessitate a cut of sixteen feet, but from the eastern end of the deep cut to the proposed summit level of the main canal the ground was favorable. In this distance of thirteen miles there would be three eight-foot locks. The course of the main canal between Seneca lake and Newtown would be, according to the engineer, nearly north and south. The descent southward from the summit to the Chemung river was fifty-three feet and the ground was advantageous. From the summit northward the route would be through four and one-half miles of untimbered marsh and for the remainder of the distance to the lake along a narrow valley, once timbered, but then cleared and settled. The lockage from the summit northward would be four hundred and forty-three feet in a distance of about seven miles. In his estimate, the engineer computed the cost of construction, with wooden locks at \$240,000 and with stone locks at \$407,598. After taking into consideration all the products of the mines, the fields and forests, and the greatly increased imports that might be expected to be brought into this territory, Mr. Geddes concluded that the construction of the canal would be a profitable venture for the State.

With this report as a basis for their arguments the Assembly committee on canals made an effort to secure legislative action to authorize a canal along this route. This effort was ably supported by several persons immediately interested in the project, in an argument setting forth the revenue that would be yielded by the proposed canal. In order to estimate the probable income to be derived from the canal, some information was obtained as to the amount of tolls that were being paid for produce and other articles that were floated down the Susquehanna from that section of the state to Baltimore. It was considered that if the canal was constructed, this produce would be carried to Albany, for a continuous water communication would thus be afforded from Montezuma, on the Erie canal, to Newtown, a distance

of about seventy-eight miles, as the Cayuga and Seneca canal was being built at this time. The figures showed these tolls to be about \$29,000 and it was estimated that, in addition, about \$13,000 would be paid annually in tolls on coal that would be transported on the proposed canal from the bituminous coal region, upon the Tioga river, to the Hudson. One of the most essential reasons for building the canal was a need of an immense amount of coal by the salt industry of central New York. The supply of wood was fast becoming exhausted and it was considered that the time was not very far distant when the manufacture of salt would be very much crippled, unless a cheap supply of fuel could be obtained. The promoters also laid great stress on the fact that a company had already been incorporated in Pennsylvania for the purpose of building a canal from the coal mines to the State line, as soon as New York State should begin construction on the proposed Chemung route. A bill appropriating \$300,000 for the project was introduced in the Assembly, but was lost in the Senate.

In 1827 and 1828 the Legislature again deliberated upon the question, but with no favorable results, and in 1829 the petitioners renewed their efforts. Their persistent labors were rewarded at last, and an act (chapter 135) was passed on April 15 authorizing the canal commissioners to construct the canal on the route suggested by Mr. Geddes, from Seneca lake to Elmira,^a provided that they could complete the canal and feeder at a cost not to exceed \$300,000. The feeder was to be built from the summit level to the Chimney Narrows, on the Chemung river in the town of Painted Post, and was to be made navigable. The law stated that work should not be commenced until the Seneca and Susquehanna Lock Navigation Company had released to the State all the rights, powers, privileges and immunities granted by the act incorporating the company in 1815. One clause of the act specified that the route should be known as the "Chemung Canal," and another provided that the tolls should not be less than those in effect on the Erie and Champlain canals.

When the news of the passage of the Chemung canal bill was received in the county there was intense gratification, not to say excitement. In Elmira the satisfaction was unbounded. In the

^a Formerly Newtown, changed in 1828 by act (chapter 336).

evening there was a celebration; not a formal, conventional affair, but an "old time jollification."⁷

After the navigation company had willingly surrendered their rights, the canal commissioners caused the routes of the canal and feeder to be surveyed, and estimates of the cost to be made by Holmes Hutchinson, who began his work in June, 1829. Mr. Hutchinson's estimate placed the aggregate cost of both canal and feeder, exclusive of damages, at \$531,125.00, and this included an allowance of twelve per cent, two per cent more than the usual allowance.

In general, except in the valley of Catharine creek, the configuration of the ground and the character of the soil were considered favorable for the cost of construction of the canal and its feeder and also for their maintenance. The most expensive parts would be the dam at the head of the feeder, the deep excavation on its summit level and the large number of locks from the summit level of the canal to the head waters of Seneca lake. The deep excavation on the feeder extended about two miles, ranging from a cutting of ordinary depth to one of twenty feet. The character of the soil was ascertained by sinking shafts at the deepest point to within four or five feet of the required depth. This soil was coarse gravel, mixed with sand and loam. It was expected to find places where these materials would be cemented and hard to excavate. The line from the summit level to Seneca lake passed along the narrow valley of Catharine creek, a distance of about nine miles, with a descent of four hundred and forty-one feet. In this valley the surface of the ground was broken and uneven, and the creek, in several places, crossed the line, thus rendering it necessary to alter and straighten the course of that stream, and to protect the banks of the canal against the destructive effects of its floods. It was proposed to connect the canal with the inlet of the lake a few rods below the village of Havana.

This inlet intersected the lake near the east shore and its entrance was obstructed by a bar near its mouth, which presented the greatest obstacle to natural navigation. In order to obviate the enormous expense of excavating and maintaining a navigable channel through this bar, it was planned to cut a canal of nearly

⁷Towner's *History of Chemung County*, p. 124. (1892.)

half a mile in length from a bend in the inlet to the lake near the west shore, where the entrance would be in deep water and less liable to obstructions by alluvial deposits. At Elmira the canal would begin at the river with deep excavation through a street, then rise eleven feet by a lock, thence for the remaining distance to the summit level the excavation would be easy. The engineer planned for locks to be constructed of wood, connected with a breast wall of masonry extending across the head of the lock. This wall would terminate the upper level, and be so united with the lock as to admit of any part of the wooden structure being repaired without disturbing the stone work or earth. To protect the timber from destructive contact with the earth, the embankment upon each side of the lock was to be so formed as not to allow the earth to come in contact with any part of the woodwork, but the water of the lower level would be permitted to flow around the outer sides of the lock.

The length of the proposed canal from Seneca lake to Elmira was nineteen miles, and the navigable feeder from the Chimney Narrows to the summit level, in the village of Horseheads, thirteen miles. Mr. Hutchinson also surveyed a line for continuing the canal from Havana to the village of Jefferson (Watkins), the distance being three miles, estimating the cost at \$16,035.

In November, 1829, the commissioners advertised for proposals for contracts, and about six hundred propositions for various parts of the work were received. The lowest contained an offer to make the canal for \$245,000 and the highest, for \$433,000, while there were two propositions for constructing the whole work for about \$300,000 each.

In February, 1830, the canal commissioners, who up to that time had not accepted or acted upon any of these propositions, were requested by the Assembly to report their proceedings in relation to the canal and also in regard to the revenues to be derived from it. The commissioners submitted the report of Mr. Hutchinson, together with the figures obtained from the bidders, but stated they were not prepared to give a satisfactory answer regarding the probable amount of revenue. However, from figures compiled in 1829 by the chairman of the Assembly committee on canals, the commissioners estimated the annual revenue at

\$22,000. In the report was also a statement that all the several kinds of work, for which estimates had been made, could probably be done for the prices affixed to them, but the commissioners were apprehensive lest the estimated allowance for contingencies might prove insufficient. They said that experience had shown that proposals and sureties for the performance of contracts afforded an uncertain test of the expense of a public work; that in most instances contracts made for prices below the value of work were abandoned; and that adequate prices were a far more satisfactory guarantee for the performance of the contracts than the obligations of third persons, who sign the bond without any expectation of ever performing its condition or paying its forfeiture.

The friends of the canal insisted that the canal commissioners' estimate of tolls was too small because it was calculated upon too short a length of canal. They contended that the canal should be credited with the item of lime, which was omitted from the estimate used by the commissioners. They claimed duties upon 3,797 tons of salt, that quantity being the probable increase which the salt trade would receive from the construction of the canal. They also contended that not enough lumber had been allowed by the commissioners, insisting that very small quantities of this article would continue to pass down the Susquehanna river if the Chemung canal were made.

The strongest argument advanced by the canal advocates was, that the State stood pledged to perform the work upon certain conditions, and that these conditions had been met. Inasmuch as the proposals to construct the canal and feeder for \$300,000 had been accompanied by good and sufficient security, to repeal the law, they contended, after the only condition upon which performance depended had been fulfilled, would be to violate the pledge of the State. The Legislature took this view of the matter, and after tabling a resolution to suspend all further proceedings and operations until otherwise ordered by the Legislature, it passed a concurrent resolution which ordered the canal commissioners to proceed with the work in pursuance of the act of April, 1829.

Early in the spring of 1830 the proposals received in 1829 were re-examined, and those most favorable to the State were selected,

contracts being awarded for nearly every part of the work at prices which, in the aggregate, after adding engineering expenses and other necessary items, amounted to \$290,263.

Nearly all of the contractors were men of experience and skill in constructing canals, and during the first season they succeeded in making satisfactory progress. A very considerable portion of the work, however, was done by sub-contractors and for prices which, in many instances, were too low. Several of these sub-contractors were men possessing neither character nor responsibility and in consequence many laborers left the canal unpaid. Farmers, mechanics and merchants were defrauded of their rightful dues, and a want of confidence prevailed. Therefore, the operations of the year 1831 were sensibly affected by these occurrences and in 1832 unfavorable weather and scarcity of laborers retarded the work.

However, navigation would have been opened in the fall of this year had not the locks, after being filled with water, proved defective. The locks were constructed of wood, supported on the sides with braces, with a stone wall of masonry at the head, and a dry wall on the sides, resting on the foundation timbers, and were of ten feet lift, and the defect consisted in their not being properly supported on the sides to resist the great pressure of water within the chamber of the lock when it was filled. Those locks on which the work was well executed were frequently filled with water without producing any material injury, while others, on which the work was badly executed, gave decisive evidence of being imperfect. An experiment was made upon one of the most defective, and it was ascertained that they could be made sufficiently strong by more securely bolting to the bottom sill the longitudinal sill, into which the short upright posts were framed; by additional braces, and by increasing the dry wall to the extent of about fifty cubic yards for each lock.

This plan for repairing the locks was adopted, and by a vigorous prosecution of the work during the following winter and spring, the entire line of the canal was ready for navigation in May, 1833, being completed at a cost of \$314,395.51. As this sum exceeded the appropriation of the act authorizing construction, an additional sum of \$16,000 was granted by the provisions of an act (chapter 164), passed in 1832.

When the canal was completed there was rejoicing among the inhabitants of Elmira, the event being the occasion of a celebration which, however, proved to be somewhat premature. "A boat-load of celebrants went up as far as Pine Valley, having added to their number others from Horseheads and on the way. The boat used was a scow owned by Frederick Granger, and its usual employment was in bringing down stone from the narrows up the river for building purposes. . . . The craft at the celebration was crowded and all had to stand up, but the enjoyment was great at the cost of a 'shilling' a head. A great many flags were flying; there were speeches and songs, and much genuine rejoicing."⁸

The prism of the canal and feeder was forty-two feet wide at water-line, twenty-six feet wide at bottom, and had a four-foot depth of water. There were fifty-three locks, each ninety feet long between gates by fifteen feet wide, having a total lock-age of five hundred and sixteen feet. This canal was said to be the cheapest of the State canals, costing but \$8,504.96 per mile. The length of navigation, including two and one-half miles of pond in the Chemung river above the feeder dam, was thirty-nine miles.

The feeder, it will be remembered, was built from the Chimney Narrows (near Corning) to Horseheads, and was for the purpose of supplying the canal with water from the Chemung river. The wooden dam across the river at the head of the feeder was six hundred and forty-five feet long and seven and one-half feet high, having stone abutments. In 1831, before work on the dam was started, the serious difficulties in the navigation of the Susquehanna river, in consequence of the dams erected by the State of Pennsylvania, excited some solicitude in relation to the plan on which this dam should be constructed. The evident importance of this subject induced the principal engineer to make a personal examination of the dams across the Susquehanna river in Pennsylvania, and after a consultation with several experienced navigators, a scheme was devised for constructing a chute in the dam for the purpose of passing "arks and rafts." Plans were prepared for a chute forty-seven feet wide and one hundred and fifty-six feet long, with piers or wings extending

⁸Towner's *History of Chemung County*, p. 125.

up-stream—the one on the river side being ninety-five feet long, and the other two hundred and forty-five feet—so as to secure a safe and convenient entrance. An apron was carried from the chute on an inclined plane for a considerable distance downstream. In 1838, this chute was lengthened to about two hundred feet.

Originally the dam had been located farther down, near the lower end of a rapid, the plans calling for a structure five hundred feet long. Upon investigating the dams in Pennsylvania, it appeared that this location was liable to produce a condition which had been one of the chief sources of difficulty in that state, for it was feared that the end of the chute would be so near deep water as to create a swell which would break the arks and rafts in passing. In order to avoid this objection it was decided to locate the dam farther up the rapid. This alteration lessened the original height of the dam, but increased its capacity to discharge the floods by giving to it an additional length of one hundred and forty-five feet.

The opening of navigation did not occur in May, 1833, as expected, but, owing to a flood which wrought much damage, was delayed several months. The Chemung river rose to a height of more than ten feet over the dam; the waters broke around the dam and effected a large breach in the south embankment; the water undermined and threw down the lower half of the south abutment, and ran over the stone work at the head of the guard-lock. Plunging down the feeder for about five miles, it made a breach in the embankment one hundred feet long and four feet below the bottom of the prism, and, continuing on its work of destruction, it caused a deep and extensive break in the high embankment at the head of the three locks at Horseheads. During this flood the Chemung dam settled for several feet at the lowest point. On the main canal the aprons at the heads of the locks, in most cases, were undermined and embankments were washed away. When the waters had partially subsided, some persons engaged in navigating the river wantonly injured the head of the chute at the feeder dam. Although complaints were entered before the proper authority and warrants procured for the arrest of the offenders, when the case was presented before the grand jury of Steuben county, the crime was allowed to go unpunished.

By the most vigorous exertions all the injuries to the canal and feeder were repaired and navigation was opened in October of 1833. As a result of the flood numerous claims for damages were presented, amounting to about \$60,000. Under an act (chapter 178, Laws of 1835) the damages awarded to these claimants were paid out of the general fund.

In 1838, the Assembly received petitions from inhabitants of Steuben county, praying that the Chemung canal feeder be extended to a point at or near the junction of the Cohocton and Tioga rivers, or that a company be chartered for that purpose. The petitioners stated that the canal and feeder did not answer the expectations of the people engaged in doing business upon them, as there was not always a sufficient depth of water to navigate with full loads, this insufficiency being due, they alleged, to an improper termination of the feeder and a wrong location of the dam. They were of the opinion that the extension of the feeder to the point named in the petition, which was about three miles higher up the river, would be more beneficial to the country, and that a full supply of water could be obtained for navigation—an opinion which was manifestly absurd. The wishes of the petitioners, however, were not granted.

At the next session several petitions both for and against this extension and also for improving the chute at the feeder dam were presented to the Legislature. At that time large quantities of lumber were being annually manufactured above the dam and were sent down the river in "arks or rafts" which had to pass through the chute. Owing to the abruptness of the descent, and the large volume of water passing through this narrow channel during the spring freshets, when much of this rafting trade was carried on, considerable property was injured, lost or destroyed each year. Consequently the dam and chute were the cause of great complaint to all engaged in the lumbering business, and these complaints were duly set forth in the petitions presented to the Legislature during these years. The prevailing opinion seemed to be in favor of lengthening the chute, as it was claimed that at a dam at Towanda, on the Susquehanna river, which was fourteen and a half feet high, there was a chute over one

thousand feet long, which afforded a perfectly safe and convenient mode of descent.

The names of many highly respectable citizens, who had resided in that locality for a long time, were attached to the petitions asking an extension of the canal, one having been signed by twenty-two supervisors of Steuben county. However, it appeared from evidence before the Assembly committee on canals that some of these supervisors and other petitioners were large owners of real estate near the termination of the proposed extension. That the opinions of these men were biased may be concluded from the fact that later some of the supervisors and many others of the original petitioners for the removal of the dam and the extension of the feeder, had changed their views as to the propriety of the work, and their names were afterward affixed to remonstrances against it, while others acknowledged their error and advocated the improvement of the chute, which they now believed was all that was necessary to perfect the navigation.

Among the remonstrances was one which carried great weight, as it came from the company which was operating a railroad that formed a connecting link between the State canals and the coal fields of Pennsylvania. This was the Tioga Coal, Iron, Mining and Manufacturing Company, a body incorporated by an act of April 9, 1828, and authorized by an amended act of March 26, 1833, to construct a railroad from Corning, situated at the head of navigation on the Chemung canal feeder, to the State line of Pennsylvania, where it connected with the Tioga Navigation Company's railroad, which extended to the coal mines at Blossburg, Pennsylvania, about forty miles from Corning. In their remonstrance they say:—

“They believe no public benefit will be realized from such extension, but on the contrary that it would be a public detriment, at least to the extent of the money expended in constructing said canal or feeder.

“That they have, in pursuance of an act of Legislature, expended a large sum of money in the construction of this railroad, from the termination of a railroad from the coal mines at Blossburg, in Pennsylvania, to the pool of the Chemung canal dam; and have also made a large expenditure in the purchase

of lands for a depot, and in the construction of a basin, &c., for the transshipment of coal and other commodities from the rail-road to canal boats, at the termination of their rail-road on the south side of the pool of said canal dam, and at the head of navigation. That by the removal of the present dam, and the extension referred to above, the said company will be left with the termination of their rail-road, fixtures, &c., &c., on the opposite side of the river from the canal, and will be deprived of the navigable waters, which they have, in good faith, purchased and paid for.

“ . . . in their opinion, it is a measure calculated only to promote the speculative designs of a few individuals at the expense of others who are engaged in the construction of public improvements for the public good as well as their own; . . . that the extension asked for would cost at least one hundred thousand dollars, which sum expended in the construction of stone locks, (which will soon be required to render the present canal navigable,) would much better subserve the public interest than to extend the said canal.”⁹

The canal committee reported against the removal of the State dam and the extension of the canal feeder, and in favor of improving or reconstructing the chute in the dam, and this work was authorized by a bill which was introduced and which afterward became chapter 236, Laws of 1839.

This work was rendered imperative for the safe passage of rafts. The water had worn away the bed of the stream below the chute for a distance of one hundred and twenty feet and to a depth of from twelve to twenty feet. The rapid current in the chute and the deep water below caused one part of the ark or raft to be in swift and the other part in deep and comparatively still water, occasioning the fore part of the float to go deeply into the water, thus suddenly checking its progress, and either breaking or throwing it out of the channel. The old chute was forty-seven feet wide, with a timber floor commencing about eighty feet above the dam, and extending down the stream one hundred and eighty feet, the floor being on an irregular inclination and having a descent of four feet in one hundred and thirty feet of its length.

⁹*Assembly Documents*, 1839, No. 198, pp. 4-5.

During 1839, according to the provisions of the law, the chute was extended, the plan being somewhat changed and improved. The new length was four hundred and fifty feet, the width forty-six feet, and the timber floor was one foot in depth and extended the whole length on a regular inclination of one foot in each one hundred feet of length.

The following year the commissioners reported that, from the lateness of the season and an early rise of the river, the lower end of the work done in 1839 had not been sufficiently secured against injury by floods: and that it was found that the heavy volume of water descending the chute had excavated a deep pool at the foot of the plane, and had raised a heavy bar of gravel and stone immediately below and in front of it, with the consequence that rafts descending this plane with great velocity, and suddenly plunging into deep water that had comparatively little motion, were so crushed and shattered that the value of the fragments was not equal to the expense of collecting them.

The loss to those engaged in the lumber and timber business on the rivers above the dam was serious, and this disaster clearly demonstrated that this great industry of a widely extended section of country would be utterly ruined, unless a remedy could be applied. An attempt was made to remove this difficulty and danger by adding a horizontal section to the lower end of the chute, and by protecting the channel below from being again washed out, by placing heavy brush timbers on the bottom, with their butts securely fastened to the lower timbers of the chute. The bed of the river at this place consisted of small stones and loose gravel and had made the construction and maintenance of the dam and its appurtenances exceedingly difficult and expensive. There was much reason to fear that, should this improvement to the chute be insufficient, it would not be practicable to sustain navigation on the Chemung canal and at the same time to protect the timber and lumber trade of the upper branches of the river without resorting to some plan radically different from that on which the work was originally constructed.

At this time the State of Pennsylvania was engaged in constructing what was called the North Branch division of the Pennsylvania canal. After a large portion of it was finished, the part remaining to be built being near the line between the States

of New York and Pennsylvania, the authorities of Pennsylvania, being desirous that the North Branch canal should be connected with the canal system of this State, took the initiative in bringing about concerted action on the part of both States. It was the consensus of opinion among those interested, that the connection would be highly beneficial to both States, by securing to each a valuable interchange of commerce, especially in the staple articles of coal, plaster and salt.

Accordingly a committee was appointed by the Pennsylvania Senate to consult with the authorities of New York State for the purpose of ascertaining their opinion relative to the connection between the North Branch route and the Chemung or Chenango canals, or both. The committee arrived in Albany in April, 1839, and immediately informed Governor Seward of the object of their visit. The Governor, in turn, notified the Legislature, which appointed a joint committee to confer with the Pennsylvanians upon the subject. The result of the conference was the enactment of a law (chapter 306) by the New York Legislature, which states that "the canal commissioners shall cause a route for the continuation of the Chemung canal to be surveyed, from its present termination near Elmira, in the county of Chemung, . . . to the State line near Tioga point, at the termination of the North Branch canal of Pennsylvania, and cause an estimate of the cost of said continuation to be made, and report to the next legislature of this state at the opening of its session."

This action, to a certain extent, accorded with the desires of residents of Chemung county, who had, during the session, presented a large number of petitions in advocacy of extending the canal to connect with the North Branch line.

The report was submitted by the canal commissioners to the Legislature in 1840. Joseph D. Allen had been appointed to survey two routes, one on the north, and one on the south side of the Chemung river. It appeared from the engineer's report that the route on the north side of the river, from the termination of the canal to the State line, was between seventeen and eighteen miles long, and had seventy-five feet of lockage, while along the southern route the distance was between twelve and thirteen miles, and the lockage forty-one feet. The estimated cost of construction on the north side, with composite locks, was \$391,056.67, and on

the south side, with the same plan of locks, \$271,648.36. This made a difference in length of about five miles, and a difference in cost of \$19,408.31 in favor of the south line.

While the sentiment in the Legislature was favorable to the new project, yet it seemed to be questionable whether any new work of this kind should be commenced at that time, owing to the deranged condition of the monetary affairs of the country and the difficulty attending the raising of moneys. Therefore, the project was allowed to remain in abeyance until 1846, when the question was revived, and finally resulted in private enterprise (The Junction Canal Company) taking up the work.

In 1854 the Legislature by act (chapter 227) authorized the connection of the Junction canal and the Chemung canal, which established a through water communication from the canal system of New York State to Chesapeake Bay. As a more complete description of this survey of 1839 and of the subsequent building of this connecting canal is given elsewhere in this volume—in the history of the Junction canal—it is not necessary to dwell upon the subject at this time.

For some time prior to 1840 the locks on the canal, which originally were cheaply and imperfectly constructed, were known to be in a dilapidated state. On September 18, 1839, the canal commissioners had passed a resolution requesting Joseph D. Allen to examine into the condition of the structures. He reported to the Legislature on February 15, 1840, that the condition of the locks was such that all efforts to sustain them by additional repairs would be poor economy. The strength of the wood was constantly diminishing, while the difficulties attending their maintenance were constantly increasing. While he thought that many of them might possibly be maintained by repairs for two or three years, still it was a menace to navigation to place reliance upon any such hazard. He also reported that the guard-lock at the head of the feeder must, of necessity, be rebuilt without delay.

On March 14, 1840, the citizens of Elmira held a meeting to discuss matters relative to the condition of the locks and the necessity for their speedy reconstruction in order to preserve navigation in the canal. A report of the proceedings of this meeting, forwarded to the Legislature, showed that there was danger that some of the locks would fail during the season of 1840. Care-

ful examinations had been made since the breaking up of winter, and the locks were found to be in a much worse condition than was supposed at the time of Mr. Allen's examination. Unless provisions were made for the immediate commencement and the diligent prosecution of the work of rebuilding these locks, it was feared that navigation would have to be suspended altogether, and thus destroy a new and valuable branch of trade, the importance of which was only beginning to receive general recognition. This subject was of vital interest not only to the inhabitants of Chemung county, but also to a large portion of the people of western New York, because of the fact that the canal was looked to as the only avenue through which they could expect to reach the inexhaustible mines of bituminous coal in the interior of Pennsylvania.

The Legislature of 1840, realizing the necessity of lock improvement, enacted a law (chapter 176), which authorized the canal commissioners to rebuild the locks on the canal and feeder, but leaving to their discretion the plan for rebuilding them. This act appropriated \$100,000 for the project.

In July the canal commissioners, after inspecting the canal, held a meeting in the village of Jefferson, situated at the head of Seneca lake, for the purpose of deciding upon a plan for constructing the locks. At this meeting the engineer, who had been directed to take charge of this work, presented his report, accompanied by four different plans, with detailed estimates of the cost of the work on each plan. The first was for composite locks (wood and stone) of the same size as the old ones, ninety by fifteen feet, estimated to cost \$7,263 per lock. The second plan proposed wooden locks of the same dimensions, to be constructed of squared timber in the form of cribwork, the estimated cost being \$4,390 for each lock. The third plan was for composite locks with chambers one hundred and ten by eighteen feet, corresponding in size with those then in progress on the Erie canal enlargement. The cost of a lock of this description was estimated at \$11,536.48. The fourth was for timber locks of the same size, estimated to cost, for each lock, \$5,803.78.

The least expensive plan, that of timber locks of the smaller size, was adopted. In September, 1840, the work was put under

contract, and all locks, in their new condition, were brought into use in the spring of 1843, the Legislature in 1841 having passed an act (chapter 219) providing an appropriation of \$200,000, as the amount appropriated in 1840 was inadequate.

In building the Chemung canal, a portion of the Seneca lake inlet (Catharine creek), extending from lock No. 1, at Havana, down the stream about three miles, was relied on for navigation. But the formation of bars in that part of the inlet had become so extensive as to impede navigation. A dredging machine was kept in operation, but with little effect, as new bars formed in other places, or the cuts in the old ones filled in as fast as they could be excavated. These difficulties constantly increased and became so formidable that navigation was suspended for nearly half the season of 1840. This showed the necessity of constructing a new channel, independent of the inlet, from Havana to the lake. The trouble caused a petition to be presented to the Legislature of 1841, requesting a new line to be built. In response the Legislature included in the act appropriating an additional sum for completing the locks, a provision authorizing the canal commissioners "to construct a canal of the dimensions of the Chemung canal, upon such route as they may upon examination designate, from or near its junction with the said inlet to the navigable waters" of Seneca lake, and giving the officials power to borrow such money as should be needed for the improvement.

Two lines were surveyed by Joseph D. Allen, both independent of the inlet. Each route commenced at the Havana lock and terminated at the channel originally cut between the creek and the lake, one being called the east line and the other the west line. The former pursued a nearly direct course from the point of commencement down through the central part of the marsh to the entrance of this cut of half a mile, which had previously been made from the inlet to the lake; while the latter pursued a more westerly direction, following near the base of a high hill on the west border of the marsh, until it reached the entrance of this original cut. Thence, both lines followed the route of the canal to its junction with the lake. The distance from the Havana lock to the lake, by the east line was 2.64 miles, and by the west line 2.93 miles. Estimates were made for two different dimensions of canal, one to correspond with the size of the Chemung

canal as it then existed, forty-two feet wide at water-line, twenty-six feet wide at bottom, with four feet depth of water, and the other the same size as that of the enlarged Erie canal, seventy feet wide at water-line, fifty-two and a half feet wide at bottom, with seven feet depth of water. The estimates were: east line, 2.64 miles, original size, \$52,643.10, enlarged size, \$76,815.23; west line, 2.93 miles, original size, \$27,718.20, enlarged size, \$69,865.79.

After the completion of the surveys the canal commissioners examined the ground and the engineer presented another plan which proposed an independent line to extend from lock No. 1 northerly for about a mile and a quarter, and then again enter the inlet below the point of difficulty. This plan was preferred to either of the others and was the one adopted. The work was completed and the new route used for the first time in 1842. This extension made it necessary to pass Fall brook under the canal.

In 1842 an act (chapter 114) known as the "Stop law," put an end to works of improvement on this canal, in common with all the canals of the State. This act prohibited all work other than that which was essential to retain the canal in a navigable state. This condition prevailed until, by the provisions of the Constitution of 1846, a tax for canal purposes became effective.

The business transacted on the waterway in 1844 showed a gratifying increase over previous years, making it evident that the work of lock rebuilding had been well advised. All the locks were rebuilt except the one which connected the canal with the Chemung river at Elmira, which for some unknown reason, had not been put under contract with the others. The structure had not been used for several years, being in such a dangerous condition that it had become necessary, for the safety of navigation, to put in a bank of earth at the head of the lock. In addition, the foundation of the lock had been placed so high that boats could not pass it during low water in the river.

In 1845 some of the inhabitants in that vicinity sent a petition to the Legislature expressing a desire that the lock should be rebuilt. In the following year, by an act (chapter 325), the Legislature authorized the canal commissioners to reconstruct the lock at an expense not to exceed \$5,000. In rebuilding the

structure the bottom of the new lock was sunk two feet below that of the old one. It was completed for navigation in 1847.

It will be remembered that in 1841 an attempt was made to overcome the difficulties of navigation between Havana and the Seneca lake by constructing an independent canal for some distance and then by utilizing for the remainder of the route, the inlet which had been a part of the canal since its origin. Notwithstanding this work, traffic was interrupted each year and large sums were expended in an effort to maintain navigation upon this level. The Legislature of 1848 afforded relief by passing an act (chapter 218), which authorized the canal commissioners to construct the "Chemung canal from its intersection with Catharine creek, by an independent channel northerly to the Seneca lake, west of the mouth of said creek; such intersection with the lake shall be through the navigable straight cut already constructed by the state, unless in the judgment of said commissioners, the interests of the state will be best promoted by connecting it with the lake at a point nearer the mouth of said creek." The commissioners were also authorized by the act "to change the course of Watkins creek to the lake, so as to protect the canal from injury by said creek." Under the provisions of the law, the necessary surveys for the new route were made, the line was located and contracts were let. This work was completed in 1849, making the Chemung canal an artificial waterway throughout its length. By this improvement the maintenance of a very difficult and expensive section of canal was avoided, and for the first time in many years loaded boats passed without detention from lock No. 1 at Havana to the lake during the entire season.

In 1850 another improvement was made by constructing a towing-path from the head of Chimney Narrows to Corning, a distance of nearly one mile. Since the construction of the canal, tolls had been charged from that village on all property shipped to and from that point, but the State had never furnished conveniences for towing farther than the head of the Narrows. It had always been necessary to push boats by hand against the current up to the village. When high water prevailed the boatmen suffered vexatious delays in trying to ascend, while at these times boats were brought down-stream at great risk, for in extreme

floods many of the craft had gone over the feeder dam. This work had been urgently solicited for some time and subsequently proved to be a great convenience.

In 1850 the locks on the Chemung canal, rebuilt of wood in 1841-43, were in a much decayed and unsafe condition, and the canal commissioners recommended that most of them should be rebuilt, advising an improved form of composite lock. According to the officials, the locks as rebuilt had been constructed upon a plan which was defective in not properly securing the sides of the chambers so as to withstand the pressure of the earth and the action of frost, many of them, the first season of their use, having required extensive repairs. It was often with difficulty that boats could pass through some of the locks, because the chambers had become so contracted by the pressure of earth on the sides. To remedy this difficulty it was necessary to remove the embankment from the back of the timber work, and by filling the locks with water, to force back the sides of the chambers to their original positions. With some of the locks this process had to be repeated each year, and for purposes of economy, it was customary at some of the more troublesome not to replace the embankment but to leave the excavation open on the sides.

In 1853 the attention of the Legislature was called to the rapid increase of business upon the canal. At this time a large additional trade was anticipated upon the completion of the Junction canal, the Williamsport and Elmira railroad to Elmira, the Corning and Olean, and the Allegany Valley railroads to Corning, which would bring the Chemung canal into connection with the rich coal fields and extensive lumber districts of Pennsylvania. The presence of this connecting canal and of these railroads, either terminating at Corning and Elmira, or passing through towns bordering on the canal, where already there were large quantities of freight for transportation, indicated plainly that this canal was to become one of the most important feeders of the Erie canal. The value of exports by canal from Corning during 1853, not including those from Elmira, was estimated at over \$16,000,000, while in lumber alone upwards of 87,000,000 feet were shipped from Corning.

To protect slack-water navigation in Corning, immediately below the tow-path bridge, two thousand feet of docking were

constructed in 1853, at an expense of \$9,000, and in 1854, an addition of one thousand feet was built, costing \$6,000. This improvement afforded great facility to boats in receiving and discharging their cargoes at a point where it was much needed.

Not until 1856 was any legislative action taken in regard to rebuilding the locks. To meet emergencies the structures were repaired as well as possible from year to year. The Assembly of 1856 requested the State Engineer, Silas Seymour, to communicate to the House such facts as he possessed relative to the policy of reconstructing the locks and as to the manner of such reconstruction and the size of locks. In his reply, Mr. Seymour referred to the dilapidated condition of the structures, and from his personal knowledge of the canal and its general condition, he judged that the locks should be rebuilt. "As a measure of commercial policy," he said, "the State ought to make the locks on this canal conform in size to those of the Cayuga and Seneca canal (110 feet by 18 feet) . . . as early as the state of the finances will permit, and that all permanent repairs and re-construction of locks ought to conform to this object." The Assembly committee on canals claimed that the rapidly growing business of the Chemung canal showed the policy of enlarging the Cayuga and Seneca canal, through which the Chemung communicated with the Erie, to have been wise, but it was manifest that its benefits would, in a great measure, be lost to the State unless the locks on the Chemung were made of corresponding size, so as to pass the boats employed on the Erie canal to the Chemung river. The business done on the canal was deemed more than sufficient to warrant the adoption of the enlarged lock policy, and as it would become a necessity when the great coal fields of Pennsylvania should be made a tributary to our commerce, which was then on the eve of accomplishment, a bill identical in its provisions with the act passed in 1847 for the enlargement of locks on the Cayuga and Seneca route, was introduced in the Legislature of 1856 but failed to pass. This bill provided for locks the size of those on the enlarged Erie. The opponents of the bill argued that the locks could discharge two or three times as much tonnage as ever passed over the canal in any one year and that until the canal could be worked to its fullest capacity there would be

no increase of revenues to the State consequent upon the enlargement of locks. They also claimed that the supply of water was entirely inadequate even for the locks as they then existed and that the need of the canal was not enlarged locks but increased water-supply. In fact, they characterized the expenditure of this large sum of money as a positive injury to the State, contending that the Chemung railroad, located along the line of the canal, provided that section of the State with ample means to transport its products to market. The defeat of the bill was a keen disappointment to those most interested, who for four years had been petitioning the Legislature for enlarged locks.

While awaiting the action of the Legislature relative to authorizing enlarged locks, the work of rebuilding had been delayed as long as the safety of navigation would justify. In the winter of 1856-57 the canal commissioners began to reconstruct the locks, adopting a plan of composite lock of the same size as the old structures. Two locks were rebuilt during this first winter at a combined cost of \$31,334.34. This sum indicated that the total cost of reconstruction would be so large that the commissioners returned to the plan of wooden locks and in the succeeding years continued the work of rebuilding.

The sides of the chambers in the new locks were so reinforced by piles and bracing as to be secured in their places in a permanent manner. The chief defect of the former locks had been the springing in of the sides to such an extent as to require the faces of some to be hewed off six inches, or about half of the original thickness of the timber, so as to give the necessary width for the passage of boats.

Contracts for three locks were let in 1857, for six in 1858, and for seven in 1859; these seven were built at an average cost of \$9,420. This work was continued till 1867 when all of the locks had been rebuilt, either in whole or in part. Although the agitation for enlarged locks continued for several years, this object was never accomplished, but they were all rebuilt of the original size of ninety by fifteen feet.

The water-supply of the canal at this time was such as to substantiate the claim of the opponents of enlarged locks and was a source of much vexation. During a season of low water, navigation was seriously impeded by the want of a supply to

keep up the levels. At one period for several weeks all the water that could be saved from the Chemung river was not sufficient. This diversion of water from the river caused the authorities of Pennsylvania to make a protest. So serious was the difficulty that some attempt to obtain an adequate supply had to be made. An examination of Mud and Little lakes, located in Schuyler county, with a view to converting them into reservoirs, was made in 1856 and it was believed that these bodies of water, in addition to the natural supply of the Chemung river, would afford all the water necessary, even with enlarged locks and would enable a large quantity to be passed to the Junction canal. The engineer who had made the survey reported favorably, estimating the capacity of the proposed reservoirs at 313,196,400 cubic feet, which was equal to 23,199 lockages with locks of the size of those in use on the Chemung canal, or an average of one hundred and ten a day for two hundred and ten days of navigation. The cost, exclusive of land and other damages, he placed at \$37,500. These lakes, however, were never brought into use as reservoirs.

On June 17, 1857, the main canal was seriously damaged by a flood caused by the breaking away of several dams on Catharine creek during a severe freshet. Altogether there were 4,573 feet of tow-path carried away at different points and while repairs were in progress another freshet occurred on the thirtieth of the same month, which destroyed all the work of repair done to that time. Navigation was suspended for thirty days in consequence of these freshets. In November there was still another flood which entailed an expenditure of about \$50,000 for repairs.

In this year there was a further consideration of lock enlargement, and another bill was presented in the Legislature, but it met the same fate as the one of the previous year. In 1858 the Legislature was again pressed for action, and the Senate instructed the State Engineer to furnish the approximate cost of such work and his opinion relative to the measure. Mr. Richmond, the State Engineer, estimated the cost of each enlarged composite lock, including the expense of pit, embankment, etc., at \$19,000, or for the whole number on the entire route at \$1,026,000, and he stated that the most economical plan of maintaining navigation did not require the construction of entire new locks but the renewal of such parts as would put the whole in

such a condition that they might be successfully used for ten or twelve years, or until such test of the increase of business, or such other developments should have been made, as would render it practicable to more correctly determine the proper time for enlarging the locks. The Legislature, by an act (chapter 211), provided that whenever, after the completion of the enlargement of the Erie canal, it became necessary to rebuild any locks on the Chemung, then, if the canal board so decided, the locks should be of the composite type and enlarged to the size of those on the Erie.

In 1858 the Chemung canal was connected, by the completion of the Junction canal, with the entire system of canals in Pennsylvania, thus enabling the people to reach by canal the vast deposits of both anthracite and bituminous coal in that state.

The locks on the Junction and North Branch canals, although not as large as the Erie enlarged locks, were larger than those on the Chemung. This was advanced as a cogent reason for enlarging the Chemung locks. But as the act of 1858 forbade the enlargement of the locks of the canal until the Erie canal in its enlarged size was completed, the canal commissioners continued making repairs and reconstructing locks of the original size. In 1861 contracts for rebuilding ten wooden locks were let.

In this year the customary damages by flood were prevalent. On October 20 the water in the Chemung river at Corning rose to a height of about fourteen feet above ordinary low water, filling the canal with gravel at the foot of the guard-lock for a distance of about five hundred feet, and at a point about two miles below, causing a breach in the bank, nearly eight hundred feet of tow-path going out to a depth of about ten feet below canal bottom. Several smaller breaks occurred simultaneously on other portions of the feeder. In September also the river had been at flood height with the result that great damage had been done both to the works of the State and to lumber and coal yards of individual companies at Corning. This trouble made people solicitous for some remedial action by the State and a petition in 1863 was sent to the Legislature which, by act (chapter 165), appropriated \$20,000 for the construction of a channel, or slip and basin, connecting with the feeder, together with such dock-

ing, etc., as would be necessary to facilitate the trans-shipments of coal, lumber and other freight without subjecting the shippers to great risks and damage from the freshets. The work, consisting of the raising of the banks and the cutting of a channel at an elbow of the river, was subsequently performed and was thoroughly appreciated by the people of that section.

In 1863, owing to a resolution of the canal board in the previous year, increasing the draught of boats from three and a half to four feet, the banks had to be raised to maintain the depth required to properly float boats drawing the increased amount of water. There was no difficulty in retaining the requisite depth, except upon the lake level, and here the greatest obstruction was the miter-sill of lock No. 1. The work of enlargement on the Cayuga and Seneca canal had so increased the channel of Seneca river as to permit a greater flow of water from the lake and a consequent reduction of its surface, so that there was scarcely four feet of water upon the miter-sill during a dry season. So troublesome did this become in 1866 that the lock was reconstructed, and the cause of complaint removed for a time, but low water in the lake continued to be a hindrance to navigation, so that in 1869 an appropriation of \$15,000 was made for dredging the lake level to obtain a uniform depth of six feet. There was delay in getting this improvement under way, and it was not till 1871 that the work proceeded under contract.

In 1863 the continued increase of business upon the waterway called for immediate attention from the Legislature to provide the needed lock improvement. The canal commissioners, in their annual report for this year, said: "The steady increase in the anthracite coal trade from the North Branch and Pennsylvania canals, and which mostly seeks a market through this canal, and the equally rapid increase in the bituminous coal business passing through the feeder and lower portion of this canal, are now shared with the Chemung railroad, whereas if large boats could pass to Elmira and Corning, the whole of this important and growing trade could be made to contribute to the revenues of the Chemung canal. The enlargement of the Chemung canal and feeder would no doubt be followed by a corresponding improvement in the North Branch and Pennsylvania canals, thus securing for all time an immense traffic through this line, and con-

tributing largely to the business of many of the other canals of this State. If this work can not be undertaken immediately, it is certain that one or more new lines of railroad must and will be constructed to accommodate this important trade."¹⁰

The Legislature of 1864 received petitions praying for lock enlargement, and passed an act (chapter 232) directing the canal commissioners, "When it shall become necessary to rebuild from the foundation any of the locks on the Chemung canal and feeder, . . . to construct and build such locks of timber, and of the same dimensions as the enlarged locks on the Erie canal." Chapter 211 of the laws of 1858 had given the canal commissioners authority to construct locks of the enlarged size, if they so decided, after completing the enlargement of the Erie. That they never so decided is very evident. Moreover, nothing was ever done under the law of 1864. The work of reconstruction, along the old lines, was nearly completed when the law was passed. This was continued till 1867, when all of the locks had been repaired or rebuilt, and were in a condition to endure until the foreshadowing of the coming abandonment made it evident that expenditures for lock enlargement were inexpedient.

Increased business in the transportation of coal showed the need of improving the Watkins harbor at the head of Seneca lake, so as to give protection for the making up of tows for passage down the lake to the head of the Cayuga and Seneca canal at Geneva. Plans and estimates for this improvement were approved by the canal commissioners and the assistance of the Legislature of 1866 was importuned, but without avail. In 1867 the sinking of several boats, with the loss of their cargoes, during a storm that raged on the eighth of May, brought clearly to public attention the imperative need of better protection to the shipping at Watkins. The Legislature of 1868 came to the relief and passed an act (chapter 715) appropriating \$30,000 for a new pier. The small size of the Chemung canal and its dilapidated condition led to its gradual abandonment as a carrier of the extensive coal trade. Watkins thus became the harbor for transshipment to boats from the railroad, which had largely superseded the canals in bringing coal from the mines. The larger size of boats could reach Watkins through the enlarged Cayuga

¹⁰*Assembly Documents*, 1864, No. 8, p. 89.

and Seneca canal. The coal shipped from this port contributed materially to increase the tonnage of the enlarged canals, a profitable market being found in Canada through the Oswego canal, and in the West through the Erie.

It was becoming very evident that the canal was not able to compete with the Fall Brook railway, which ran nearly parallel with the canal and extended to the Pennsylvania coal fields.

In 1870 another effort was made toward securing the enlargement of the waterway, but without success. This was made on the ground that the demands of the coal traffic alone necessitated the improvement.

In 1871 steps were taken to abandon a portion of the Chemung canal. This action, however, was due to local conditions, and not to the general decline in business on the several lateral canals of the State, which led to their abandonment a few years later. In that year several bridges at certain streets in Elmira needed rebuilding. It was suggested that, as there was no further use for the canal at the points where the bridges were located, the business formerly done there having gone to a new point, it would be better to abandon and fill that portion of the canal rather than to continue the cost of building and maintaining so many bridges. A law (chapter 785) was enacted in 1872 as a result of this suggestion, authorizing the City of Elmira to use as a public street that part of the canal lying between its junction with the Junction canal and the southern terminus of the Chemung, a distance of about one mile.

For the next few years only such repairs were made as were necessary to maintain navigation. The railroads had gradually absorbed most of the transportation of this section. The Legislatures of many years had failed to put the canal in a condition to compete for this traffic, appropriating year by year only enough to keep the canal open for navigation. There was also a growing sentiment throughout the state that some of the lateral canals had outlived their usefulness. The conditions on the Chemung canal were becoming such that, without a large amount of money expended on structures, there would be no assurance of its being passable or safe for any length of time. The chief remaining source of support to the canal was threatened by the completion of the Corning and Geneva railroad, and with very uncertain

prospects for the future, the waterway was regarded by one of the canal commissioners as being one of the "unfortunate 'limbs of the commercial tree,' which it would be well for the legislative 'axeman' to lop off."

In 1877 the canal, by a resolution of the canal board on January 3, became a portion of the western division, after having been embraced in the middle division since its origin.

By the Constitution adopted in 1846 this canal was to remain forever in the hands of the State, but an amendment in 1874 removed this restriction. For the purpose of determining what should be the policy of the State in regard to certain of the lateral canals, the Legislature of 1876, by act (chapter 382), appointed commissioners to make an investigation of these canals and to recommend what disposition should be made of them.

The commissioners reported in regard to the Chemung canal that the structures were in a bad condition and would require large expenditures to put them in a safe and useful state, but that the banks were in fair shape; that two miles of the route at the Elmira end had already been abandoned, the canal at that time terminating in an open field, and not being used south of the summit level. In relation to the financial side they reported that the tolls collected in 1876 were \$2,104.84; the amount of tolls contributed to the Erie, \$907.92; the sum expended for maintenance, \$9,794.71, and that at least an equal amount would be needed for such purpose for another year. As the carrying of coal had been almost entirely diverted by the railroads and as the only remaining business, the transportation of lumber, would soon cease, the commissioners recommended that the canal be opened for a part of the season of 1877, to allow lumber on hand to be shipped, and that then the canal be abandoned.

The Legislature of 1877 carried out this recommendation by enacting a law (chapter 404) which provided for the abandonment of the canal, but not until the end of navigation in 1878. Accordingly the canal remained open during the seasons of 1877 and 1878, but did very little business. The act of 1877 also provided for the disposition and sale of the canal and the lands, water-rights and other property connected with the system, declaring that when the canal should cease to be used for navigation, the water-power rights and privileges on the Chemung river, so

far as they were taken and appropriated for the purposes of the canals, should revert to the person or persons from whom they were taken or to their successors in interest.

In 1881 all the material in locks, bridges and aqueducts was sold, about \$2,200 being realized from the sale, and the remaining portions of banks and prism, under the provisions of acts, chapter 104, Laws of 1877, and chapter 344, Laws of 1878, were to be sold to adjacent owners or to parties desiring them for railroad or canal purposes.

An act (chapter 379), passed by the Legislature of 1880, gave the Board of Trustees of the village of Horseheads full and absolute control of a portion of the canal and feeder situated in that village, and an act (chapter 482, Laws of 1881) provided for the conveyance of the property, such as had not yet been sold, to "the person or persons owning the lands adjoining to the center of the prism of said canal," if the owners would file a declaration with the Superintendent of Public Works, "releasing and discharging the state from all obligation to maintain the bridges and other structures connected with such portions of said canal and feeder, and from all liability for damages arising from the abandonment thereof." Under the acts of 1877 and 1878, previously referred to, a portion of the canal extending from Elmira to the intersection of the Utica, Ithaca and Elmira railroad at Horseheads, was sold to the Canal Railroad Company of Elmira, and by an act (chapter 171, Laws of 1878) a section of the line lying south of the junction of the canal with the Junction canal, was transferred to the City of Elmira for street purposes.

All previous acts, wherein their provisions applied and related to the abandonment of the Seneca lake level extending to Montour Falls (Havana), a distance of about three miles, was repealed in 1887 by an act (chapter 169). It was claimed by men representing business interests that the maintenance of this level as an outlet to the lake was of vital importance to the commercial interests of Montour Falls and an application was made by responsible parties for its purchase. In the following year, 1888, the Legislature enacted a law (chapter 416) which appropriated \$20,000 for the construction of a new basin at Montour Falls and for reopening this portion of the old Chemung canal for the convenience of the business people of that place, thus

affording a waterway accessible to the Erie canal through Seneca lake and the Cayuga and Seneca canal. This work was accomplished and the waterway was again opened for navigation. Catharine creek had broken into the old channel near the head of this level and had nearly filled the prism with a large deposit of earth. In repairing this breach, it was deemed expedient to guard against its recurrence by excavating a new channel for the creek, thus eliminating the bend which approached the canal. This level did not remain in use for many years, for the creek again broke into the canal at a point about midway between Montour Falls and the lake and so filled the channel with bars as to render it unnavigable. This portion of the canal is still nominally open, but in fact has not been used for several years.

That the Chemung canal was a potent factor in developing the section through which it extended cannot be doubted. That it prepared the way for the later railroads and for the rich rewards of traffic which they have received is equally true. That it might have had a longer useful existence, even, perhaps, to the present time, if it had been properly cared for, is an open question, but there is significance in the fact that, in the revival of waterways (but of a much larger size than of old) which seems to be sweeping over the whole world, this route is being considered as one of the avenues for connecting the new canals of our State with the rich coal fields of Pennsylvania.

CHAPTER XV.

THE CROOKED LAKE CANAL.

From the inception of the project to the abandonment of the canal.

The Crooked Lake canal began at Dresden, on the western shore of Seneca lake, with which it joined at a point about thirteen miles above the foot of the lake, and extended westerly to the village of Penn Yan and into Crooked (Keuka) lake, from which it took its waters. It rose from Dresden to Penn Yan about two hundred and seventy-seven feet, through twenty-eight locks, in a distance of nearly eight miles.

At the thirty-seventh session of the Legislature, in 1814, a resolution was adopted in the Senate, and afterwards concurred in by the Assembly, authorizing and requiring the Surveyor-General to explore and survey the outlet of the Crooked lake and the ground between the head of the lake and the Cohocton. a navigable branch of the Susquehanna river. He was also directed to report a proper plan to connect, by means of locks and canals, the waters of the Seneca lake with the Cohocton river, together with an estimate of the probable expense of the work and such other information as he deemed useful. Doubtless the Surveyor-General considered the work impracticable, for no report was rendered and the question of a canal between these lakes was held in abeyance.

However, an agitation for the construction of a canal to connect these bodies of water became manifest in 1827, when a petition was presented to the Legislature by the inhabitants of the county of Yates, praying for the passage of a law authorizing the construction of a canal to connect Seneca and Crooked lakes with the Cohocton river. The petitioners, realizing that canals already constructed in other portions of the state had promoted population, stimulated enterprise and produced throughout the range of its influence substantial gains in wealth and all other fruits of productive industry, desired to reap the same bene-

ficial results by the construction of a canal in their midst, and therefore they joined in the cry for canals, which was being heard in all parts of the state. It was stated that the section of the state which would be accommodated by the canal was highly fertile and already settled by a large population and that business would be drawn to the canal from the county of Allegany and the southern part of Ontario. The petition was accompanied by a detailed statement of the surplus farming and other products which were expected to produce a sufficient amount of tolls in a few years to redeem the debt incurred in its construction. The Legislators paid no heed to the request in that year, but in 1828, upon the presentation of similar petitions, by concurrent resolution, they directed the canal commissioners to cause two routes to be surveyed—one from Seneca lake to the foot of Crooked lake and the other from the head of Crooked lake to the village of Bath, located on the Cohocton river. The commissioners were also ordered to report the results of the surveys and estimates of constructing the canals, to the next Legislature.

In accordance with the resolution, the report of the commissioners, with detailed surveys and estimates of the two routes made by David Thomas, an engineer trained on the Erie, was submitted to the Legislature of 1829. In relation to the Bath canal, the engineer reported that the line would require an expenditure of \$150,000, and that a feeder two miles long would be necessary. In speaking of the canal from Crooked lake to Seneca lake, which he called by way of distinction "the Penn Yan canal," Mr. Thomas stated that a pier to prevent the shifting gravel of Crooked lake from filling the outlet, and the removal of a low bank to straighten the channel a short distance below, were all that would be necessary to be done above Penn Yan. The mill-dam in this place would make slack-water navigation one mile up to the lake. The whole of the route surveyed was confined to a deep ravine through which the outlet ran, and the land was found to be of a character that would necessitate much rock excavation.

In his report, Mr. Thomas stated that the canal would have to be supplied with water from Crooked lake, but he questioned

the adequacy of this supply, as in time of severe drought it was thought that the mills on the outlet would be deprived of water, if a part should be taken for the canal. It was estimated, however, that by a short dam thrown across the outlet the lake could be converted into an immense reservoir, which would not only furnish the requisite supply for the canal, but would benefit rather than injure the manufacturers. The engineer estimated the cost of the canal at \$110,000, to which must be added, if the lake were raised, \$10,000 for the cost of the dam and guard-lock, making a total of \$120,000. The amount at first appeared unreasonably large for so short a distance, but when the great elevation to be overcome and the difficulties that would be experienced in so narrow and rocky a valley were considered, the cost was deemed moderate. The engineer reported the elevation of Crooked lake above Seneca lake to be about two hundred and seventy feet, and the number of locks required twenty-nine, which he proposed to construct with wooden chambers.

Prior to the transmission of this report, several more petitions in favor of the canal were received by the Legislature, the signatures of residents in adjoining counties being affixed. The legislative committee, to which the report was referred, reported that public policy justified the Legislature in acting in accordance with the desires of the petitioners, and introduced a bill providing for the construction of the Penn Yan canal, the title of the bill, however, being so worded as to read "Crooked Lake Canal."

This act (chapter 120), which was passed on April 11, 1829, directed the canal commissioners to proceed with all practical diligence to construct a waterway of such size as to admit of the passage of boats then navigating the Erie canal, and authorized the locks to be constructed with chambers of wood. The commissioners were also ordered to cause an examination, surveys, levels and estimates to be made by a competent engineer to determine whether, by raising the water in the lake by means of a dam across the outlet, or by deepening the channel at that point, a sufficient supply of water for all seasons could be obtained from Crooked lake without diminishing the supply afforded by the natural stream to the mills on the outlet. However, the law forbade the construction of the canal, unless the commis-

sioners could receive good and sufficient security for completing the canal for a sum not to exceed \$120,000, unless a plan was adopted by which the canal could be supplied with water without depriving the mills of their supply and unless the owners of the mills executed a release to the State for all damages which they might sustain by reason of the construction.

Upon the measure becoming a law, the canal commissioners proceeded to carry out its provisions by appointing Holmes Hutchinson to make surveys, maps, and estimates of cost. In 1830 the Legislature, by resolution, requested the commissioners to render a report of their proceedings in relation to this canal. The report showed that the engineer's views coincided with those of Mr. Thomas in reference to the manner of securing an adequate water-supply for both canal and mills, which was by constructing a dam and thus using the waters of Crooked lake. The line of the canal, as located by Mr. Hutchinson, began a little above the upper mill on the outlet, about a mile below the foot of Crooked lake and was conducted down the valley, independent of the stream and disconnected with the mill-ponds or hydraulic works, to the point of its intersection with Seneca lake. This plan was preferable to a slack-water navigation which, if adopted, would have to be connected with the hydraulic works.

The engineer proposed to improve the navigation of the outlet from the upper mill to the lake by deepening and widening a part of the channel. This plan was deemed practicable by some, but was considered objectionable by others, as this part of the outlet was then used as a basin for saw-logs and other private purposes which would cause interruption to navigation. To obviate this difficulty, another scheme was proposed in which it was planned to begin the canal at the lake, and in order to avoid the formation of a bar of gravel or sand at its mouth, to construct a breakwater. In his field work, the engineer found that the valley of the outlet was generally very narrow and at a few points so contracted as scarcely to leave sufficient width for the canal and stream, and as the canal, according to the plans, would occupy the bed of the stream at several places, a new channel would be required for the latter. The cost of the canal as estimated at \$119,198, which included an allowance of thirteen per cent for contingencies, appeared to be reasonable, but it did not

include the expense of a canal from the upper mills to the lake nor for a breakwater, the probable cost of these being placed at five or six thousand dollars.

The provisions of the law, which required the release of claims for damages or their payment by private subscription, after an assessment by the canal appraisers, not having been complied with, the canal commissioners postponed further action until such time as the appraisers could assess and individuals pay the damages, agreeable to the enactment of the statute.

The commissioners, however, did not fail to perceive the danger of building too many canals nor to sound a note of warning against the overexploitation of the canal policy as it related to costly laterals. To their report was appended a statement that the probable revenue from such a waterway would not be equal to the interest on its cost and the expenses of its repairs.

In the month of August, 1830, the canal appraisers ascertained the damages contemplated by the act authorizing the construction of the canal. Several mill owners readily executed releases to the State, being of the belief that they would not suffer for lack of water, while the amount of damages awarded to those owners of hydraulic works, who did not release their claims, was paid by the persons interested in the improvement, into the Bank of Geneva, to the credit of the canal commissioners, to be paid to the persons entitled thereto when the construction work was begun. Soon after the provisions of the act in reference to damages had been complied with, public notice was given for receiving proposals to construct the canal. The propositions were examined in October, 1830, and the terms offered being found to come within the requirements of the law, the contracts for the execution of the work were awarded at prices which aggregated, after including an estimate of engineering expenses, \$95,820.

The work was begun in April, 1831, and by the terms of the contracts, the canal was to be completed by September, 1832. Arrangements were made to prosecute the work during the winter of 1831-2, and the completion of the canal at the time stipulated in the contracts was confidently expected, but unfavorable weather and scarcity of laborers retarded the progress of the work. The extensive public works, which were in progress in

the State of Pennsylvania at this time, attracted the attention of laborers on this canal and many left for that state with the expectation of obtaining higher wages and a more lengthy employment. Undismayed by depletions in their forces, the contractors on this canal appeared to manifest a willingness to prosecute the work with proper diligence and they made efforts to procure men by sending agents and printed notices into other parts of the state, offering liberal wages. They possessed character and responsibility, and a general confidence seemed to prevail until the month of October, 1832, when a contractor for two miles of canal failed in paying his men. He was a foreigner who had great influence with his countrymen, and up to this time had succeeded in obtaining their confidence so as to protract his payments until his indebtedness exceeded \$3,000. This occurrence so exasperated some of his men that after taking from him every vestige of movable property and setting fire to his shanties, they left the country.

This affair had an unfavorable influence throughout the whole line of the canal and interrupted the progress of work. A portion of the excavations under the charge of this contractor was very expensive, and he had persevered with an intention of finishing all his work, under the expectation of obtaining an extra allowance on a part of it. The sureties of the contractor, immediately after his failure, made arrangements for the completion of the unfinished work. Another factor which served largely in protracting the work was the presence of hardpan, this material or rock appearing in almost every lock-pit and proving to be expensive to excavate.

The canal was finally completed so as to permit navigation upon it on October 10, 1833, at a cost of \$156,776.90. The contracts for work were within the engineer's estimates, but owing to unexpected difficulties the total cost was somewhat increased. The Legislature of 1833 passed an act (chapter 115), authorizing the canal board to make allowances to contractors for extra expenses and labor, occasioned by a change of plan or by work of a different character or description than originally contemplated. The size of the canal prism at completion was forty-two feet width at water-line, twenty-six feet bottom width and four

feet in depth of water; the number of locks was twenty-seven lift-locks and one guard-lock, the dimensions of which were ninety by fifteen feet.

In 1834-5 complaints were received by the Legislature from mill owners who had been induced to believe that the construction of the canal would not diminish the supply of water for their factories. They averred that the immediate effect of letting water into the canal in the year 1833 was to lessen the quantity of water in the stream, thereby diminishing the supply to a greater extent than they had suffered in seasons of drought. The Legislature in 1835, by the passage of an act (chapter 276), authorized the canal commissioners to deepen the upper level of the canal two feet and six inches, to construct a feeder from the outlet of Crooked lake into the canal and to reconstruct the existing dam to four feet above the bottom of lower level, the supposition being that these improvements would be effectual in giving relief to the manufacturers.

To carry into effect these provisions, the commissioners advertised for sealed proposals, but only one proposition was submitted for the level-deepening, the bid exceeding the appropriation, while for the other work but few bids were received. It was ascertained that Waggoner and Gillett, the mill owners at the head of the outlet, considered the plan of deepening the level injurious to their mills, and that some of the other owners of hydraulic works on the outlet were opposed to such action.

Several mill owners were of the opinion that the most effectual relief would be afforded if the State should purchase the water-privileges on the upper dam, belonging to Waggoner and Gillett (who had exercised a control over the water of the lake after it had become depressed below the top of their dam), and then if a proper regulation of the waste gates at the dam were maintained, it was believed that the mill owners on the outlet below the mills of Waggoner and Gillett would secure a more uniform supply. However, the commissioners contracted to have a waste gate constructed at the State dam, and to have a feeder built from the outlet of the lake into the canal below lock No. 8.

In 1836 another controversy arose over the water-supply for the mills, when Abraham Waggoner forwarded a petition to the Assembly asking for remuneration for damages alleged to have

been sustained in consequence of the construction of the canal. The petitioner asserted that he was the owner of a sawmill and a grist-mill; that before the Crooked lake canal had been built his sawmill had a full supply of water for at least four months in the year and that the grist-mill had a plentiful supply from the first of March to the end of the fall season. He contended that the dam erected by the State across the outlet above his mill was four feet higher than the bottom of his flume, depriving him of the use of two feet of water from the surface of the lake and seriously interfering with the operation of the mills. The petition was referred to the canal commissioners, and they reported that the purchase of the water-rights of Waggoner and Gillett would probably prove a more satisfactory solution of the difficulty than the adoption of that portion of the plans proposed in the act of 1835, which called for the deepening of the level, for it was thought that the water-privileges could be obtained for a sum considerably less than the cost of the proposed deepening. The report of the commissioners was followed by the enactment of chapter 216 which amended the act of the previous year (chapter 276) so as to authorize the canal commissioners, if they deemed it advisable, to purchase the mills and the water-privileges of Waggoner and Gillett for the purpose of regulating the flow and discharge of the waters of the Crooked lake into the natural channel of the outlet. Shortly afterward the new waste gates on the State dam were completed and conditions were improved, the manufacturers receiving a larger and better regulated supply of water.

For the next few years the locks on the canal required extensive repairing, the structures being of framework and constructed upon the same plan as those on the Chemung canal where so much trouble was experienced. In 1841 they became a source of much vexation and expense and at several points navigation was maintained with difficulty. However, with constant repairing they were sustained through the following seasons until 1845, when the Legislature was forced either to make appropriations for repairs or abandon the canal.

The financial troubles of 1837 and the change of political control in 1842 had brought about the enactment of the "Stop law," (chapter 114, Laws of 1842), which prohibited work on all the

canals, except such repairs as were necessary to keep the waterways in a navigable condition, and thereafter no considerable funds were available until the new Constitution of 1846 provided for the levying of a tax each year for the needs of the canals.

Of course the question arose at this time concerning this waterway, in common with the other lateral canals, as to whether it would ever prove itself a profitable investment for the State. Although the Comptroller's report of 1842 showed that, since its completion, this canal had cost the State \$97,965 more than it had contributed in tolls, the clamorings of interested people for further improvements were too insistent, and public sentiment was still too strongly intent on the benefits that would accrue, if the laterals were properly equipped, to allow their abandonment for many years to come.

The pressing need for repairs led the Legislatures of 1844-5 to pass laws for improving the canal, this action being deemed necessary both to put the canal on a better paying basis and to preserve the canal from utter uselessness within a few years. The law enacted in 1844 (chapter 313) required the canal commissioners to improve the lower or lake level of the canal, so as to adapt it to the natural level of Seneca lake by lowering the bottom one foot and thus giving at all times four feet of water in the level. By 1845 the locks were in so dilapidated a condition that the Legislature by an act (chapter 338) directed the commissioners to reconstruct them and appropriated \$25,000 for the work, an additional appropriation of \$25,000 being allowed by act (chapter 325) passed in 1846.

Upon recommendation of the engineers, the canal commissioners approved a plan for composite locks, and on June 26 contracts were let for eleven structures, the stipulations being that the head of the locks and the sides of the chambers, for a length of six feet below the upper quoins, should be of rubble masonry laid in hydraulic cement and that the remainder of the sides of the chambers should be composed of substantial dry walls, faced with a framework of timber and plank. The locks were completed and first used on the first of May, 1847, and in 1848 the rebuilding of all the locks was completed at a total cost of \$107,264. By an act (chapter 213), passed in 1849, the

commissioners were authorized, "if in their opinion the interests of the state would be promoted thereby," to rebuild the lock at the termination of the canal, at Seneca lake, and to build it of stone instead of making a composite lock, such as was then authorized by law. In 1850 the new lock was completed, and the work of constructing a pier in Seneca lake at the terminus of the canal was started, the structure being first used in 1851, having been built for the purpose of rendering a convenient and secure harbor for boats.

In 1853, in order to enable steamboats to enter the canal in safety from Crooked lake, \$5,000 was appropriated by an act (chapter 620) for the improvement of that part of the canal between the foot of the lake and the village of Penn Yan. This work was imperative, as much serious difficulty had been experienced at times by boats being driven upon the beach whenever high winds prevailed. The work of improvement was put under contract in the spring of 1853 and the contractor prosecuted his work until the sum of \$3,900 had been expended, when the contract was abandoned. It was relet in September, 1855, in which year the further sum of \$3,500 was provided by an act (chapter 570) to complete the work. The amounts appropriated became exhausted on August 1, 1857, and the contractor, although duly notified of the fact, continued with the work after that date upon his own responsibility, until he had completed the dredging to the Liberty street bridge, as ordered by the acts of 1853 and 1855. The expenditures made for the work attained the desired results, as navigation was so improved that boats were afforded a good entrance from the lake in all kinds of weather.

In 1859 the harbor in Seneca lake at Dresden required much dredging, as deposits had accumulated in the basin to such an extent that loaded boats could not gain access to the warehouses, nor lie at their piers to load or unload their cargoes. The improvement at this point necessitated an outlay of nearly \$1,000.

For several years navigation was maintained in a good condition with the ordinary expenditures for repairs, but in 1863 it was perceptible that the canal had been greatly neglected from want of sufficient appropriations, and that it required immediate improvement. The dilapidated condition of the guard-

lock at Penn Yan and the difficulty experienced during the dry season in maintaining the requisite depth of water on the old miter-sill made it necessary to construct a new lock, which was built of stone and placed eighteen inches lower than the old one. In July a heavy freshet caused serious damage to the canal and rendered necessary repairs that suspended navigation for two months. The repairs cost the State \$3,704.15 beyond the amount required to be done by the repair contractor. At this time the banks of the canal were not properly protected against the outlet of Crooked lake, which flowed immediately in the rear of the towing-path bank, and they were constantly showing signs of weakness, requiring great watchfulness and also large expenditures to protect them.

In 1864 work was started toward deepening the Penn Yan level, in order to conform to the miter-sill of the new guard-lock, a work that for a long time had been very much needed, but only a portion of the work was done at that time. The level was about a mile and one-half long, and the water became so low during the latter part of the season of 1869 that boats could not draw the regulation depth, and the Legislature of 1870, by act (chapter 767) appropriated \$2,000 for further work in bottoming out the level.

During the year 1865 the foundations of eight locks were found to be defective; the jaws and lower wings were constantly pressing together, requiring the face of the walls to be dressed off so as to allow the passage of boats, and this had been done to such an extent that the locks were liable to fail at any time. Under an appropriation of \$40,000 by act (chapter 715, Laws of 1868), the structures were rebuilt wherever necessary and this work continued until 1872, when other locks were reported to be in a condition that necessitated rebuilding. At the opening of navigation in this year another serious problem confronted the State authorities—the presence of but twenty-three inches of water on the lower miter-sill of the lock at Dresden. Crooked lake was also very low and for nearly half of that season, boats were limited to a draught of two feet.

For the next few years no work of any description was done. It was impossible to keep the canal in condition without an enormous outlay and the authorities deemed it imprudent to

appropriate any considerable portion of the ordinary canal fund to this waterway, when its commerce was so small and steadily diminishing and when the money was so urgently needed on canals that were carrying a much larger traffic. Notwithstanding the condition of the locks during 1872, the repair contractor creditably kept the canal in fair navigable condition with the result that boats made quicker passage upon it in that year than during the few years preceding.

The attitude of the commissioners made it apparent that the canal had served its usefulness, and the question of abandonment arose in the minds of the Legislators in the Assembly of 1872. A resolution was passed requesting from the Attorney-General an opinion as to "whether there [were] any constitutional objections to the abandonment of the Crooked Lake canal, and the sale of the same by the State." While the Constitution distinctly prohibited the sale of the canal, the Attorney-General was of the opinion that the Legislature could, without violating its constitutional duty, practically abandon the canal by failing to make appropriations for its repair and management, and subsequently could sell the land which it occupied.

This procedure did not produce any immediate result, but soon the first step toward closing several canals was taken. As the lateral canals had not been self-sustaining, people had come to think that the State should be relieved of the burden of maintaining them, and finally public opinion became so aroused as to demand their abandonment. This subject is carefully considered in a separate chapter and need not be mentioned here except as it relates to this particular canal.

The Constitution of 1846, prohibiting the sale or lease of any of the canals, was amended in 1874 by removing from certain canals such prohibition, and the Legislature of 1875 enacted chapter 499, requiring the canal board to examine these canals and ascertain whether they should be sold, leased or abandoned. The board rendered a report, but as details such as were desired were not embodied therein, another act (chapter 382) was passed in 1876, appointing special commissioners to make an investigation. In their report they stated that the structures and banks of the Crooked Lake canal were found to be in fair condition; that in 1875 the tolls were \$126.09; tolls contributed to Erie,

nothing; expended for maintenance, \$7,710.15; and estimated to maintain for 1877, considerable more than the amount for 1875.

The commissioners further reported that this canal was not necessary as a feeder to the Erie, its value for hydraulic purposes inconsiderable, and that, although it had been built to afford a section of about three hundred square miles of the best farming lands of the state the privilege of water communication with the commercial marts of the East and had been the cause of erecting some twelve or fourteen storehouses for receiving products of that section of country, and although the closing of the canal would mean the disuse of these storehouses and the deprivation to that territory of suitable transportation facilities, except a railroad that would tend to divert the traffic to Pennsylvania, they were of the opinion that the State was not warranted in maintaining the canal, and they recommended its abandonment.

Acting upon that recommendation there was an official abandonment on June 4, 1877, by act (chapter 404) of that year, although there had been no navigation on the canal since 1875. In January, 1877, the waterway was transferred from the middle division to the western division by resolution of the canal board. The law providing for abandonment also conferred upon the canal commissioners or the Superintendent of Public Works the right to sell the canal, its appurtenances and water-privileges, provided the hydraulic action and the natural flow of the outlet of Crooked lake should not be diverted or changed. In the same year the Penn Yan and New York Railway Company made an application to the canal commissioners for the purchase of the banks and prism at a reasonable price, stating that they desired the property for the bed of a railroad to be constructed, maintained and operated between Penn Yan and Dresden.

In pursuance of the law which became operative in 1877, the canal commissioners advertised for sale the materials of the locks, aqueducts and bridges, but as the sales had to be adjourned from time to time, the efforts to sell the structures were abandoned. The officials also considered the application of the railroad company and favored legislative action to meet the request of the company. Consequently the Legislature in the following year

passed an act (chapter 143) authorizing the commissioners of the land office, for the consideration of \$100, to release the banks and prism to the railroad company with the proviso that, if the railway should not be completed within two years from the passage of the act, the property should revert to the State and be disposed of as specified in chapter 404, Laws of 1877. The latter chapter was amended by an act (chapter 344), also passed in 1878, empowering the Superintendent of Public Works to sell all such portions of the canal as should be desired by adjacent owners on condition that the State should be released from all obligation to maintain the bridges and other structures located thereon.

During 1878 the land commissioners released the banks and prism in pursuance of act (chapter 143) passed that year, to the railroad company, which, in consequence of delay, was granted further extensions of time in which to complete their line by acts (chapter 34, Laws of 1882, and chapter 471, Laws of 1884).

In 1878 the offices of the canal commissioners were abolished and all the powers which had been vested in them in connection with the sale of the canal passed into the control of the Superintendent of Public Works by the enactment of chapter 522 of the Laws of 1879, which was amended in 1881 by act (chapter 157) authorizing the superintendent to advertise for sale all property, privileges or rights intended to be sold, other than those already acquired by adjacent owners and the railway officials.

At present the line of the canal is occupied in large part by the Penn Yan branch of the Pennsylvania division of the New York Central Railroad system, a few vestiges of the old prism and structures still remaining. As this canal was not a link in any great through system, and had not opened the way to extensive lake traffic, its influence was entirely local and limited to a small area. It served a purpose in helping to develop the country and in affording communications until it paved the way for railroads, but its contributing territory was too small to sustain financially a canal built along a route that proved expensive in both construction and maintenance. Therefore, it never could have been a paying investment, and it gave way before the railroads that could be operated economically under the conditions that prevailed in that locality.

CHAPTER XVI.

THE ONEIDA LAKE CANAL.

Including the construction of the canal by the Oneida Lake Canal Company, the purchase by the State, the abandonment of the Old Oneida Lake canal, and the construction and abandonment of the New Oneida Lake canal.

As we have seen in the account of the first attempts at internal improvement, the first means of communication between the western and central parts of New York state and the navigable waters of the Hudson river, was through the Seneca, Oswego and Oneida rivers, Oneida lake, Wood creek and the Mohawk river. This communication was an imperfect one, being interrupted by falls and by carrying places, at Rome and Schenectady, but was improved, at an early day, through the medium of the Western Inland Lock Navigation Company, the State itself being a large stockholder in the company.

After the completion of the works of this company, a great impulse was given to the settlement of the country in the vicinity of Oneida lake, and its tributary streams, and for many years afterward, this territory was regarded by emigrants, as one of the most desirable portions of our state, consequently the value of land was much increased and the country improved rapidly, in wealth and population.

At the time of constructing the Erie canal, the works of the Western Navigation Company were purchased by the State and then abandoned. Thus the inhabitants along the lake and streams, were at once deprived of an access to market which they had enjoyed for twenty-five years. The effect of this policy proved ruinous to the whole of that section of country; land depreciated in value, and for several years emigration from that part of the state was greater than the increase in population.

During the succeeding decade the prosperity of that section gave but few signs of recovery from the blow which it had received. The inhabitants, meantime, were making repeated efforts to induce the State to open a communication from Oneida

lake to the Erie canal. After a lapse of ten or twelve years from the closing of the old works, they despaired of securing direct aid from the State for this object, and applied to the Legislature for a charter to enable a company to construct a canal from Oneida lake to the Erie canal. After strenuous efforts the Legislature was finally induced to take cognizance of their appeals in 1832, and passed a resolution asking the canal board, to which had been referred the bill to incorporate the Oneida Lake Canal Company, to report its opinion of the utility of the contemplated improvement, "and whether it would be most promotive of the interests of the state," that the water route should be built by the State or by an incorporated company.

In reporting, the board stated that the construction of a navigable communication between the Oneida lake and the Erie canal would be useful to a large number of inhabitants residing near the lake by giving them advantages of conveying the products of the soil to market, and also that the waterway would be useful to the State by bringing freight to the Erie canal which, without the communication, would never reach it. But as to the feasibility of either the State or an incorporated company making the improvement, the members of the board considered it their duty to refer to the probable amount of tolls that would be realized from the canal. Taking this view of the subject, and judging of the probable amount of revenue that would be derived by the amount that the State had received from the lateral canals already constructed, they thought that the best interests of the State would be conserved if the work were done by an incorporated company.

The board, however, stated that there was an objection to the construction of the canal on account of the want of water for feeding it, and that unless this objection were removed it would be useless to authorize its construction. It was not considered safe to calculate upon drawing from the Erie canal a sufficient quantity of water to continuously feed the canal, as all of the surplus water upon the Erie in this locality had been sold by the canal commissioners (in pursuance of an act, chapter 275, Laws of 1825) to two persons, the lease having been given to the purchasers on August 25, 1827.

In order to compensate for the water that should be drawn from the Erie, an article providing that the company should con-

struct a feeder from Oneida creek to the Erie, was inserted in the bill incorporating the company, which was passed on March 22, 1832, being act, chapter 53.

The capital stock was placed at \$40,000. One of the canal commissioners was to designate where the route should be located, and all expense incurred by him, in employing an engineer to survey and examine the route, was to be defrayed by the company. Permission was given by the act to take possession of such lands as would be indispensable for the construction of the canal, giving in exchange a price to be arranged by mutual agreement. In case of a disagreement as to the compensation, the property was to be appraised by three competent persons who were to act as commissioners and award to the owner or owners an amount which they (the commissioners) deemed to be the full value of the property.

By the act of incorporation the company was authorized to construct and maintain the canal for fifty years, and to establish rates of toll not to exceed three times the amount then charged on the Erie canal. If the feeder were made navigable the same rates of toll could be charged as on the Oneida Lake canal. The act provided that the canal should be of suitable dimensions to pass boats navigating the Erie. The State reserved to itself the right, at any time within ten years after the passage of the act, to take possession of the canal and feeder, upon paying to the company the whole amount of moneys expended, together with interest at the rate of ten per cent after deducting the amount of tolls which might have been collected on the canal and feeder.

By the most active and unceasing exertions of some of the inhabitants of the towns on the northern and eastern shores of Oneida lake, a company was formed under the charter and sufficient stock subscribed to warrant the commencement of work.

For the purpose of opening vast tracts of wood and timber land, located in the region where it was planned to build the canal, as the wood and timber would be the chief marketable commodity, the company importuned the Legislature of 1833 for an amendment to the charter, which would authorize an appraisal and sale of certain lands to the company.

The lands thus sought consisted of a tract of sixteen hundred and ninety-two acres lying on the south side of the Seneca turn-

pike and west of Oneida creek, which was then occupied by Indians, and a second tract of fourteen hundred and thirty-eight acres lying in a narrow strip along the margin of Wood creek, which had been formerly reserved for the accommodation of the Western Inland Lock Navigation Company, and became the property of the State by the purchase of the interest of that company.

The first tract was ceded to the State by a treaty with the "first Christian party of Indians," on October 8, 1829, which secured to the Indians the undisturbed possession of the land, until they should be prepared to migrate to Green Bay. It was, therefore, deemed inexpedient to grant to any individual or company the preemptive right to lands in the possession of Indians, who had been assured of possession during their pleasure. As the second tract had been paid for out of the canal fund, and as the act of 1817, which authorized the Erie canal, had specified that all the net proceeds from the Western Inland Lock Navigation Company were to be applied toward the payment of the canal debt, it was considered that a diversion of any part of their value to other purposes would be an infringement of the spirit of the Constitution. Therefore, the petition of the Oneida Lake Canal Company for these lands was not granted.

The canal, as constructed, extended from the Erie canal at Higginsville to Wood creek, four and one-half miles, and thence to Oneida lake, a distance of two miles; the creek was used for navigation with a towing-path on the southerly bank. Early in the fall of 1835, the canal was completed at a cost of \$64,886.37, and the feeder at an additional cost of \$13,938.48, making a total of \$78,824.85. In the four and one-half miles of canal, there were seven wooden locks, besides a guard-lock; the prism was forty feet wide at the water-line, twenty-six at the bottom, with four feet depth of water, and from the junction with the Erie to the lake the descent was fifty-six feet. The feeder was about three miles in length, extending from Oneida creek near the village of Oneida Castle, to the Erie canal, at a point about three miles west of the intersection of the Oneida Lake canal. The width of the feeder was twelve feet upon the bottom, with a few wider places for the convenient passage of boats.

Navigation on the canal was opened on September 12, 1835, but at this time the feeder was not navigable as a small expenditure was still required to render it so. In fact, the feeder never was made navigable, and no water of any consequence was ever received from that source. The account of this, however, will be noticed later in this chapter.

In this year by act (chapter 70), the company was authorized to increase its capital stock by an amount not exceeding \$30,000, and in the following year (chapter 534) further power was given to augment the amount of stock by a sum not to exceed \$10,000, over the increase allowed by the act of the previous year. This law was passed principally for the purpose of responding to the petition of the company, which, desiring to improve the navigation of Fish creek above its confluence with Wood creek, was granted permission by the act to extend its improvement up Fish creek for a distance of four miles and to charge the same toll as was then collected on the canal. Subsequently this improvement was accomplished.

After the canal had been in operation for two years, the inhabitants of the region benefited by the waterway presented a petition to the Legislature, requesting the State to purchase the Oneida Lake canal and feeder. These petitions were renewed each year till the request was granted.

The petitioners claimed that the construction of the canal by means of an incorporated body had been an evil; that the tolls collected by the company were exceedingly oppressive and that business done on the canal had fallen off in consequence of this great drawback to the industry and enterprise of the inhabitants of that portion of the state. The petitioners believed that the only measure by which they could obtain relief from the burdensome tolls would be State ownership, followed by the same rate of tolls as charged on the Erie canal.

The petitioners also urged, as a main inducement for the purchase by the State, the means which the possession of these works would afford for obtaining an additional supply of water for the enlarged Erie canal. This was a consideration that was of a somewhat weighty character as the feeder emptied into the long level between Utica and Syracuse, where a want of water was often experienced.

During the season of 1839 it was found that the Oneida Lake Company was not conforming to the requirements of the charter, which provided that it could use an equal amount of the waters of the Erie canal to feed the Oneida Lake canal, as was supplied by the feeder. An examination was instituted, which resulted in showing that the feeder delivered to the Erie canal little more than five hundred cubic feet per minute, while the canal used over nine hundred cubic feet per minute. By a measurement of Oneida creek at the same time, it was ascertained that this stream was capable of affording about fourteen hundred cubic feet per minute, but for some reason it was not transmitted through the feeder.

In answer to petitions, bills were introduced in the Legislatures of 1838 and 1839 for purchase by the State, but were not acted upon. In 1840, upon a similar request the Legislature granted the prayers of the petitioners by passing an act (chapter 258), authorizing the canal commissioners to make the purchase for the State (for a sum not to exceed \$50,000). On June 23, 1840, the canal commissioners appointed a committee of two to determine whether it would be expedient for the State to purchase the canal and feeder, and in March, 1841, the committee reported that "they had examined the waterways in person and that, on receiving the proper evidence of title from the Attorney-General, the canal and feeder ought to be purchased by the state."

Provisions contained in the second section of the act authorizing the purchase, which related to the certificate of title from the Attorney-General and to the execution, by the owners, of a release to the State, were complied with, and on April 12, 1841, a certificate of stock for \$50,000, bearing interest at five per cent was issued by the Comptroller and delivered to the authorized agents of the company. Although the amount did not reimburse the company for the cost of constructing the canal, nevertheless the stockholders were contented, because the State agreed to maintain both the canal and feeder.

With State control came a reduction in tolls to the same rates as were charged upon the other canals. During the next few years only such work was done on the canal as was needful to keep it in a navigable condition. This canal came into the possession of the State just prior to the passage of an act

(chapter 114) passed in 1842, popularly known as the "Stop law," which limited the expenditure on all canals to the necessary repairs for maintaining navigation. The Constitution of 1846 made provision for the raising of a certain amount by tax each year to be applied toward canal purposes. It also declared that this canal should remain the property of the State forever.

From 1841 to 1845 the canal drew largely on the treasury to pay the interest on the stock issued for its purchase, and for the necessary expenses of repairs. The deficiencies had amounted to \$17,000 with a likelihood of being still further increased, as the locks were in a decayed state and considerable trouble was experienced with the towing-path along Wood creek.

In 1846 a new towing-path for a distance of one mile was constructed, a plan of pile and timber facing with a filling of brush and earth being used. The work was performed by contract and cost, including repairs to some of the locks, \$12,242. But within one year the path was so far destroyed as to be a serious impediment to navigation. The piles were lifted from their places by the ice, making it difficult to pass a tow rope over them, and nearly the whole of the path was removed by floods.

In 1847 the feeder was bottomed out and made navigable for boats drawing three feet of water, from a point near the Erie canal to the Oneida depot. This improvement was made by individuals interested in procuring navigation in the feeder. As the water was withdrawn from the feeder for the purpose of facilitating this work, the Erie canal was deprived of that source of supply until after the work was completed. However, navigation on the Erie suffered no material inconvenience while the improvement was in progress.

In 1849 the Legislature passed an act (chapter 425) directing the canal commissioners to purchase sufficient land along the left bank of Wood creek below where the canal entered the stream, for a towing-path. In compliance with the statute the additional land was taken along the creek where the original land acquired for the towing-path was washed away in 1847, the owners being willing to execute conveyances in conformity to the law.

In 1849 the lower levels of the canal had not the four feet of water as originally constructed. The increasing business upon the waterway rendered a deepening of the levels necessary, and

various other improvements were made to facilitate the large amount of business, which the canal was doing in these years.

The years between 1847 and 1854 formed the period of greatest prosperity on this canal. Notwithstanding its old locks, the tonnage carried in 1849 was nearly twice that of 1847, and nearly thrice that of 1846. Gradually business began to diminish. The locks were in so dilapidated a condition that it was apparent that a large expenditure must be made for repairs or rebuilding, or navigation must be suspended. The locks were built of wood and had been in use since the opening of the canal in 1835. In spite of thorough "shoring up" every winter the sides became "pressed in," requiring "dubbing back" each spring, and this process had been carried on so long that the sides were badly cut and weakened. At the same time the old locks were the cause of a large quantity of water being wasted by leakages through the gates. In 1862, the last season that an attempt was made to maintain navigation, the canal was nearly useless, on account of the worthless condition of the locks, which were almost impassable and wasted so much water that the supply could not be maintained from the Erie, and also on account of the bar in the lake at the outlet of the canal.

In 1860 plans were formulated for a decided improvement and an act (chapter 46) of that year provided that, whenever it was necessary to rebuild any of the locks, they should be constructed of timber and of the same dimensions as those then in use on the enlarged Erie. The cost was to be defrayed by any money in the hands of the commissioners not otherwise appropriated.

There being no funds at the time, the work was delayed, and in 1861 the Legislature amended the act of 1860, directing the canal commissioners to rebuild the locks, but the law failed to receive the approval of the Governor. However, there was favorable action in 1862, when act (chapter 486) amended section 1, of the act of 1860, so as to authorize the canal commissioners "for the purpose of ascertaining the increase of expense beyond the cost of reconstructing the locks on the old plan," to "cause accurate estimates to be made of the cost of rebuilding the locks of the present dimensions, and also the cost of constructing the enlarged locks." The additional cost of the enlarged locks was to be paid out of the general fund. The sum of \$25,000 was appro-

priated for this additional cost, but the law specified that the money should not be paid for lock rebuilding as long as the locks then in position could be repaired sufficiently to permit navigation.

As the law of 1860 was considered not to have been repealed by the act of 1862, the canal commissioners believed that the only discretionary power possessed by them was to determine whether the time had arrived when these locks could no longer be kept in good navigable condition with ordinary repairs. They made an examination of the canal in person and a majority of them were united in believing that all of the locks were not only not in a condition fit for navigation, but could not be put in such condition without reconstruction.

To digress a moment, we consider another cause of trouble in 1862, which had a decided bearing on the subsequent change in location of the canal—namely, the formation of sand bars at the mouth of Fish creek. These bars had long been a source of great difficulty, constantly changing their position during each season, but never failing to so obstruct the channel as to prevent the passage of loaded boats, all of which had to be lightened of nearly half their freight. It was considered that the best preventive against this evil was the construction of a suitable pier, to extend some distance into the lake. This subject came up before the canal board, but was dismissed on the grounds that the "blue line" of appropriation did not extend to the point where the pier should be constructed. A plan and estimate for a pier was made and submitted to the board, the cost aggregating \$8,650.

But to return to the subject of lock reconstruction. Acting under the laws of 1860 and 1862, the commissioners caused surveys and estimates to be made in the latter year, and the maps and plans were submitted on September 6th, the estimated cost of enlarged locks being \$83,375.87, not including any improvement to the prism of the canal, which was essential if the locks were to be enlarged, while the estimate for rebuilding on the old plan was \$52,360.

In the spring of 1863, the locks were placed under contract and the structures were all removed by the contractors upon the order

of the commissioner. This, of course, put a stop to all navigation, and this suspension of traffic was destined to last till 1877.

After the locks had been removed and the contractors had furnished material for rebuilding the structures, the auditor of the canal department, claiming that the locks required repairing only, and not rebuilding, refused to pay the draft. Consequently, the contractors abandoned their work, and in 1865 an act (chapter 626) permitted the canal board to settle with them on the ground that through no fault of theirs they were compelled to abandon their contracts after doing a portion of the work. The attitude of the auditor, it was alleged, was prompted by a prejudice against the canal on account of its location. He was opposed to the route followed at the time of construction, and warmly advocated its connection with the Erie canal at another point.

In March, 1863, the division engineer reported to the State Engineer the results of an examination which showed that it was impracticable to build enlarged locks on the existing route of the canal. On April 9, 1863, the Senate passed a resolution requesting the canal board to transmit to that body an expression of their opinion upon the subject.

The board appointed a committee, consisting of the State Engineer and one canal commissioner, to make investigations, and they reported that it was not economical, nor even practicable, to construct the enlarged locks on the line of the old canal; that there were good and sufficient reasons for a change of location, or a new route for the canal, whereby permanent navigation could be obtained.

Among the reasons stated was the impossibility of maintaining a towing-path on the banks of the creeks, and also of maintaining a clear and permanent channel at the mouth of Fish creek for boats of three and one-half feet draft. Owing to the fact that western winds were constantly shifting the bars and channels at this place, the continual service of a dredge and its consequent large yearly outlay was necessary to keep open a channel. The new route proposed by the canal board shortened the distance by two miles, intersecting Oneida lake in the vicinity of South bay, and reaching the Erie canal in Madison county, a short distance west of Oneida creek, in the village of Durhamville.

This line was favored as it would give a better chance for the distribution of lockage, would enter the lake near its southeasterly corner, where the shores and beach were stone, and would give a depth of eight feet of water at a distance of a few chains from shore, thus allowing boats coming down the lake to enter the canal in any wind and avoid all slack-water navigation. The point of departure from the Erie canal (which was five miles west of starting point of old route) was opposite the mouth of the Oneida creek feeder, and in the immediate vicinity of the Cowassalon creek feeder, where an abundant supply of water could be obtained.

With the old canal impassable and a new route proposed, matters were at a standstill up to 1866, when the Legislature passed a bill authorizing the opening of the old canal, or the construction of a new canal, if the canal board thought this more expedient than to open the old channel. The bill further provided for raising, by general tax, the sum of \$250,000 to be applied in payment of this improvement, and appropriated from the general fund the sum of \$10,000 to pay for the rebuilding of locks on the original route, or should the old line be abandoned, the sum of \$70,000 to meet the expense of constructing new locks, making a probable aggregate of \$320,000.

The bill was vetoed by the Governor, on the ground that the proposed project did not, in his opinion, come within the scope of the constitutional obligation of the State. So far as the construction of a new canal was concerned, the conclusion of the Governor was admitted to be correct, but there was a belief that the State was constitutionally bound to open the old line, and it was averred that, if a new and better line could be constructed at a cost not largely exceeding the expense of reconstructing the old canal, sound policy and economy would justify such a course.

In the following year, 1867, petitions were sent to the Legislature by persons who desired the reopening of the old line. The Assembly passed a resolution directing the State Engineer and Surveyor to cause a survey to be made of a route for a canal from South Bay to the Erie canal, and to report within twenty days the "most practicable and economical location for the same, with estimates of the expense of constructing such canal and the necessary locks, of the size and dimensions of the Erie canal and

locks thereon; also estimates of the cost of rebuilding and rendering available, upon the enlarged plan, the present Oneida Lake canal."

The survey and estimates along the two routes gave the following results:

Old Line—enlarging prism, \$139,100; dredging creek channel and channel through bar, \$41,030; locks (seven), \$122,975; lengthening culvert, \$2,084; bridges, \$8,793; pier and breakwater, \$59,675; total, \$373,657.

Proposed New Line—prism, \$252,100; locks (six), \$99,678; bridges, \$26,199; culverts, \$19,023; dredging at lake, \$3,131; total, \$400,131. The length of the new line was 4.88 miles.

To obtain information for a further consideration of the subject, the Assembly called upon the auditor of the canal department for a report in regard to the number of tons of property moved over the canal from 1849 to 1864, inclusive, and the amount of tolls paid on that tonnage, both on the Oneida Lake canal and on the Oneida River improvement. In addition, the auditor was asked to state the amount of tolls that the State would have received if the tonnage had been carried from Three River Point on the Oswego canal to Syracuse, and thence to Higginsville, where the Oneida Lake canal joined the Erie.

The report stated that the tons of freight moved over the canal in those years, in both directions, were 434,067, which yielded \$60,701.52 in tolls and at the same time this tonnage resulted in \$192,038.98 being paid on the Oneida River improvement. The statement of the auditor also showed that if this tonnage had been carried via the other route mentioned, the State would have received \$447,156.26 in tolls, a difference in favor of the latter route of \$194,415.76.

The discussion eventually caused the passage of a bill (chapter 934) in 1867, which gave the canal contracting board the power to open navigation on the canal by rebuilding and enlarging the locks, and also by enlarging the prism, or if it was inexpedient "to open the old line by reason of quicksand underlying it or from any other cause, to remove the location of the canal, in whole or in part, to such point" as would be beneficial to the State and would secure permanent navigation.

The law especially provided that, if a change of location were made, the route should not exceed the length of the abandoned line, nor render an increased number of locks necessary.

In order to defray the cost of improvement, provision was made in the act for the levying of a tax of one-fifth of one mill on each dollar in valuation of real and personal property in the state, the amount of such tax aggregating \$346,153.47. The law declared that a change in route should not be considered as a release or abandonment of the Oneida creek feeder, but that this should be maintained and its waters be taken into the Erie canal.

In accordance with this act the canal board had surveys made and found that the route already suggested, Durhamville to South Bay, was the most feasible to adopt. Accordingly, the work of constructing a canal along the new route, having the same dimensions as the Erie, was let to contractors on December 18, 1867, the work to be completed July 1, 1869. The estimated cost at the engineer's prices was \$306,000, and at contract prices, \$258,000.

Thus was begun the channel which has become known as the New Oneida Lake canal, the first route being designated the Old Oneida Lake canal. It was suggested by the division engineer in 1868 that the canal, when finished, could not be opened without first adding more water to the Rome level of the Erie canal.

The work of building the new canal had progressed for some time when the contractors claimed that the excavation was of a harder material than was anticipated, necessitating in some cases an increase in quantities. The Legislature of 1869 came to their relief by passing an act (chapter 913) which authorized the canal board to make supplementary contracts, but specified that the total amount to be paid should not be in excess of the appropriation.

In December, 1869, the canal board made these supplementary contracts, establishing prices to be paid for each item of work done and to be done, and also fixing a limit or gross sum as the maximum to be paid for the completion of each section of the canal. The aggregate of the supplementary contracts amounted to \$310,176.97.

When July 1, 1869, the day set for completion, arrived, the work was only about half finished.

The Legislature of 1870 again came to the assistance of the contractors by an act (chapter 737) which gave the canal commissioners authority to examine the contracts for building locks, and, if they found that the prices were fixed by officers of the State and were insufficient to pay the actual cost of the work, to fix in their stead such prices as would pay the actual cost of doing the work. In June, 1870, second supplementary contracts, for lock work only, were made.

In 1870 work was suspended because the appropriation had become exhausted. After the stopping of work, a careful estimate of quantities showed that several important items had been omitted and others underestimated, the amount of the new estimate at old contract prices being \$314,000 or at the increased prices established under the two relief bills, \$416,000, an excess over the original appropriation of \$69,846.53. The work done had cost \$330,760, leaving \$85,240 still to be expended. Adding to this an amount for engineering and contingencies, it was estimated that \$100,000 was needed to fully complete the canal.

The route had been divided into five sections, and at the time of suspension, one section had been practically completed, the other sections were about three-fourths done and the six locks nearly finished.

By act (chapter 930), passed in 1871, an appropriation of \$25,000 was made by the Legislature to complete the canal, but with so small an appropriation the contractors were unwilling to go on with the work, and the greater part of this amount was applied towards the completion of the filling of a timber pier at the lake, and some other work that was a necessity in order to protect the work already done.

In 1872 the Legislature passed an act (chapter 850) appropriating the sum of \$50,000, but directing that no portion of the amount should be used if the canal commissioners could not make a contract that would insure the absolute completion of the canal. After the passage of this act, estimates of the cost to complete the work were made on the existing plans and at existing low contract prices, in order to show that the amount of \$78,000 was necessary. Therefore nothing was done, as only one of the contracts had been canceled and the other contractors were entitled to continue until their contracts were canceled by their consent.

The division engineer reported that the amount appropriated was insufficient to accomplish the object upon any plan that would make the structures safe and secure good navigation.

In 1872 the Legislature appropriated \$20,000 for paying the contractors for the work which they had done in excess of the original appropriation. This sum added to the original appropriation of \$346,153.47 made the total amount available for the settlement of these contracts, \$366,153.47.

On October 1, 1873, the contracts for sections Nos. 1, 3, 4 and 5 were settled and canceled, section No. 2 having been settled soon after the stopping of work. The total amount paid was \$350,509.54.

An additional sum of \$25,000 was appropriated in 1873 under act (chapter 766) which, together with \$50,000 appropriation of 1872 and a small surplus from former appropriations, was deemed sufficient to warrant the letting of contracts for completing the canal.

After surveys had been made, estimates were prepared and the work was relet, as the old contracts had been canceled. Work was resumed in June, 1874, the new contracts having been awarded on December 19, 1873, under the stipulation that the canal should be finished on January 1, 1875. But when that date arrived the canal was still uncompleted and work was soon suspended, and a little later the contracts were settled. In 1875 an act (chapter 499) made it the duty of the canal commissioners and the State Engineer and Surveyor to examine several canals in order to ascertain whether there should be a sale, lease or abandonment of the routes. Because the Oneida Lake canal was so nearly finished at that time, they recommended that it should be completed and maintained, as it was probable that, with the work so far generally done and structures so newly built, the canal would not require a large outlay to keep it in repair. As a reason for completing the canal it was said that a large number of glass factories, sawmills, tanneries and flouring mills, situated along Oneida lake and its tributary streams, needed the canal as an outlet for their products, many of these industries having been established on the shores of the lake since the abandonment of the old line. There were also in the region large quantities of a superior quality of sand for moulding purposes, which was

shipped to all parts of the state, and it was argued that the use of the canal for shipments of this article would prove beneficial, as the sand was then being transported on the railroad at a great cost.

All work upon the canal was suspended from 1875 until 1877. The Legislature of 1877 enacted chapter 301, reappropriating an unexpended balance of \$48,231.20 for completing the canal, if the canal board was in favor of such action. The members evidenced their opinion by adopting plans and estimates on April 10, 1877, for its completion.

Work was at once begun under the joint supervision of the canal commissioner in charge and the State Engineer, and was finished in the following September. As completed, there were seven feet of water on the first level and five on the remaining levels.

The total cost of the canal, up to the time of its completion, is shown in the following table:

Under contracts, dated December 18, 1867.....	\$350,509 54
Under contracts, dated December 19, 1873.....	36,163 51
Under resolution canal board, adopted April 10, 1877	17,791 36
Total (exclusive of engineering).....	<u>\$404,464 41</u>
Total engineering since 1866.....	39,691 23
Grand total	<u><u>\$444,155 64</u></u>

The canal was opened for navigation on October 6, 1877. Upon admitting water several serious defects were disclosed. Although the banks had been constructed long enough to become thoroughly settled, they leaked in many places. Because of improper grouting one of the locks leaked so badly as to make it necessary to draw the water from two levels, and to remedy the defect by thoroughly grouting the walls.

On October 24, 1877, shortly after the opening of navigation, a break occurred through the berme bank just above the first lock. The damage was quickly repaired, but the canal had not been long in use again when another break compelled the closing of the

canal for the remainder of the season. To guard against the threatened danger to navigation on the Erie by a break in the high embankment at the lower end of the first level, a tumble stop-gate was placed at the junction with the Erie.

The canal was not again opened until about the first of July, 1878. The few boats that were waiting to pass had little more than reached the lake when the berme bank above the second lock became undermined and was washed out, the water reentering the canal below the third lock, and, by overflowing the banks in its course to the lake, causing considerable damage to the canal, but not greatly damaging the adjacent lands. After repairs the canal was again opened, but during the next season it was not opened, nor was it ever again in use.

The chief cause of trouble was the quicksand in the soil. The prism of the canal had not been lined with any impervious material, and wherever the stratum of quicksand had been penetrated or quicksand used in embankments, leaks were the result and breaks were liable to follow. For fear of disastrous breaches that would be attended with greater damages to the lands and property along its line, the canal was closed until some means could be devised to keep the banks intact. But, although remedies were suggested, nothing was accomplished and the canal remained closed.

First in 1879, and from time to time till 1887, the Superintendent of Public Works advocated the abandonment of the canal, as, for purposes of navigation, it was utterly useless in its existing condition. Another reason, which he considered potent in prompting such action, was the lack of water to supply the canal. The long level of the Erie canal was the only source of supply, and the drain of the lateral canal had caused such a depletion in this level as to make it difficult to keep the water at its proper height.

In 1887 the Legislature, by an act (chapter 428) which became a law without the signature of the Governor, released all the lands taken for the canal to the parties from whom they had been acquired, under the condition that the State should be relieved from all obligations to maintain the bridges and other structures connected with those portions of the canal released, and from all liability for damages arising from the abandonment. The State

reserved the right to retain such material in the locks as could be used on other canals of the State. The law directed the Superintendent of Public Works to remove the bridges where public highways crossed the canal, and afterward to fill up the bed of the canal to the level of the highways, at the same time having culverts built to carry off the water which would be apt to accumulate in the canal.

Thus ended the official existence of the New Oneida Lake canal, which had been open for so short a time and under such disastrous conditions as scarcely to be counted as a factor in the system of navigation in the state. The first level of the Old Oneida Lake canal is still open, extending northward for about a mile from its junction with the Erie at Higginsville. The channel is occasionally used for the transportation of stone, one of the few quarries of the locality being situated near its northern end. The remainder of the old route is still nominally in possession of the State, never having been abandoned by legislative act, but it has not been used since the removal of the locks in 1863.

Between 1796 and 1862, with the exception of about fifteen years, the people along Oneida lake had enjoyed direct water communication with the eastern part of the state, and there had existed a short route of transportation to Oswego. With the passing of this canal there remained only the long route by way of the Oneida river, the Oswego canal and the Erie from Syracuse. When the Barge canal shall have been completed, this territory will again be on the direct line of communication across the state.

CHAPTER XVII.

THE CHENANGO CANAL.

From the early agitation, through the building, operation, decline and final abandonment of the canal, to the present use of a portion as a feeder for the Erie canal.

In the year 1814 the proposition for a canal through the valley of the Chenango received its first legislative notice. This was in a report of the commissioners who had been appointed by the Legislature to consider matters pertaining to the internal improvement of the State. After declaring the project of constructing a canal between the Hudson and Lake Erie entirely practicable, "they add with much pleasure, that it will not be difficult to extend this communication to the fertile vales watered by the Susquehanna and its wide spreading branches. Hence, they presume, that the public spirit which has always characterised Pennsylvania, will, at a proper time, induce her to co-operate."¹

To connect the Erie canal with the Susquehanna river, and thus with the Pennsylvania canals, routes through several valleys were considered—particularly two; one up the valley of Oriskany creek and thence down the Chenango and Susquehanna rivers to the state line; the other up Seneca river and Seneca lake and the valley south to Chemung river and thence down to the Susquehanna. Along a part of the Seneca-Chemung route. State canals were built and in use for many years, and eventually, through private enterprise, the connection with the Pennsylvania system was completed, but along the Chenango-Susquehanna valleys, although a canal was open to Binghamton for a long time and a waterway for the remaining distance was partly built, the communication was never completed.

The early history of the Chenango canal shows with what persistence its advocates struggled to gain the desired waterway.

¹*Assembly Journal*, 1814, p. 243.

Defeated again and again, each failure seemed only to incite them to greater activity. Agitation for its construction was begun when the remarkable success of the Erie fired every section of the state with a desire for canals, and it was built before that mania for canal-building had largely subsided. However, it will be observed that a conservative element, partially perceiving the unwarranted extent to which this craze was trending, held in check the effort for this canal for many years. Before the waterway was authorized, three principal reasons prevented its construction. Of these, the uncertainty of a sufficient water-supply seems to have been considered very important, while the idea that its tolls might not equal the expense for maintenance and interest on original cost awakened less solicitude, and an arbitrary limit of one million dollars for its entire cost appears to have been fixed by the Legislatures.

Agitation for the Chenango canal started soon after beginning the construction of the Erie. The following reference to the project, appearing in the *Oxford Gazette*, in November, 1823, shows the attitude of the people of the Chenango valley :

"Few counties," said this article, "can approach the Erie canal with so much ease and facility as Chenango, that are situated so far from it. We may, therefore, justly consider Chenango as destined, at some future period, to become an important branch of that vast inland navigation which secures to New York a proud pre-eminence among the states of the Union. The Chenango river can be made boatable to its source, and by a short canal, the expense of which would be comparatively trifling, may be united with the waters of the Oneida creek, which leads directly into the Erie canal. This has been pronounced by competent judges practicable and safe; and at no distant day will engage the attention of our enterprising citizens."

The first well-defined effort for the canal took the form of a petition to the Legislature of 1824 from the inhabitants of Chenango county, urging the passage of a law authorizing the survey of a canal route from the Erie along the valley of the Chenango to the Susquehanna river. The canal committee of the Assembly reported favorably and introduced a bill, which was referred to the committee of the whole, but, owing to lack

of time, was not acted upon. In 1825 another petition was followed by the introduction of a bill, which successfully passed, for it became merged in the "great canal law" (chapter 236) of that year, which authorized surveys for seventeen proposed canals.

James Geddes, the well-known engineer of the Erie canal, surveyed most of these routes, transmitting his report^a to the Legislature of 1826. The proposed Chenango canal, as surveyed, extended from Chenango Point, on the Susquehanna river, to the Erie canal at Whitesboro, via Norwich; it was ninety miles long, with a total lockage of 1,050 feet; it required six miles of feeders and was estimated to cost \$715,478. Although the Assembly committee of this year reported a bill for the construction of the canal, petitions for it having been again presented, too much doubt existed concerning the sufficiency of water at the summit level, the possibility of suits for damages against the State for diverting water from mills, and the completeness of the survey for accurately ascertaining the cost, and the measure was defeated.

The canal was so earnestly desired by the people of that vicinity, that a survey was made at individual expense during the summer of 1826, in order to solve the difficulties that had arisen. Mr. Owen Forman was engaged for this purpose and he especially examined the several sources of water that could be utilized to feed the canal at the summit level. According to his report—presented to the Legislature of 1827 by the people in favor of the Chenango route—it appeared certain that a plentiful supply could be obtained without the danger of causing any heavy damages to property. This report was strengthened by the favorable opinions of David Thomas and Nathan S. Roberts, two able engineers, who had for years been employed upon the Erie canal.

At this same session petitions were also presented to the Legislature, accompanied by surveys, in favor of two other routes, one proposing to take a canal from Binghamton through the valley of the Susquehanna and the Otsego lake, and the other to start from the same point, but following a more westerly direction and passing through Cortland county, to intersect the

^a*Assembly Journal*, 1826, Appendix F, pp. 5-8.

Erie canal in Onondaga county. The Assembly committee on canals, having under consideration these petitions as well as Mr. Forman's report, unanimously preferred the route through the valleys of Chenango river and Oriskany creek, with a termination at a point between Utica and Whitesboro. Accordingly a bill for the construction of this waterway was introduced, but not until a proviso was incorporated, which put the construction of the work upon the condition that a full supply of water could be furnished. The bill passed the Assembly by a decided vote, but in the Senate the canal committee reported unfavorably, mainly on the ground of the want of detail in the surveys and estimates, but again raising the question of sufficient water-supply.

Not dismayed by former failures, the people caused a careful, detailed survey of the summit level to be made in July and August, 1827, by Nathan S. Roberts. Gagings were made of the streams which might possibly be drawn upon to supply the canal and calculations were made for large reservoirs in the swamps and ponds and on both branches of the Chenango river. The report of the engineer, accompanied by several petitions, was presented to the Legislature of 1828. Mr. Roberts was sure that the supply of water would be more than ample, and he estimated that the cost of constructing the canal would be less than one million dollars. Holmes Hutchinson, another well-known canal engineer, also made a careful examination of the route and fully concurred with Mr. Roberts' opinion regarding both the adequacy of the water-supply and the course of construction. The length of the line, as surveyed by Mr. Hutchinson, was 92.75 miles and the total lockage, 1,009 feet. He reported that the Chenango would be one of the most important lateral branches of the Erie canal.

The canal committee of the Assembly of 1828 carefully considered the project, but could not agree, and, therefore, two reports were presented. The majority report³ was adverse to the canal, on the ground that the net income would not equal the interest on the original cost. The minority report⁴ favored the enterprise, the following reasons being given in its support: first,

³*Assembly Journal*, 1828, pp. 515-522.

⁴*Id.* pp. 522-532.

it was feasible and practicable and would afford cheap transportation to a rich and populous region; second, it would promote an extensive trade in coal from Pennsylvania and in return would afford a market for New York products; third, there could be no doubt that the revenue would exceed the sum required for maintenance and interest. The minority report was adopted and a bill authorizing construction was passed in the Assembly by a large majority. In the Senate, owing to the lateness of the session and the earnest desire of the friends of the bill that action be taken at that time, the canal committee deemed it advisable to report the measure without expressing an opinion either for or against it, reserving to themselves the privilege of voting as their judgment should dictate. On final passage the bill was rejected by a vote of seventeen to twelve.

In 1829 the friends of the canal continued their activity, renewing their applications before the Legislature. In order to make their argument still more effective, they presented a report from Benjamin Wright, chief engineer of the Erie canal during its construction, who had been employed by the canal agitators during the season of 1828 to make a personal examination of the line. His ideas accorded with those of Roberts and Hutchinson; he was decidedly of the opinion that there was an abundance of water on the summit level, without resorting to a secondary supply, and after examining the estimates made by these engineers, he believed the work could be accomplished for less than one million dollars. In relation to the feasibility of the work, Judge Wright remarked: "The valley of the Chenango river, from the town of Madison, presents a formation of ground *most extraordinary favorable* for easy excavation of a canal; *so much so, that I do not think the whole state of New-York can present a similar continuous distance, where nature has given a formation more favorable for such a work, and more easy and cheaply executed.*" He concluded: "If a canal is to be made to connect the Erie canal with the Susquehannah, *the Chenango valley ought to be the place of location for the first work.*"⁵

It began to look as if the zeal of the agitators was at last to be rewarded, for an act of 1829 (chapter 72) authorized the canal commissioners to commence work upon the waterway, if,

⁵*Assembly Journal*, 1829, p. 112.

upon examination, it was certain that the water-supply for the summit level was adequate, without taking any of the waters of either Oriskany or Sauquoit creeks; that the whole cost would not exceed one million dollars; and that, for the first ten years after its completion, it would produce, in connection with the increased tolls on the Erie, an amount equaling the expense of maintenance and interest on its cost. If a negative conclusion was reached on either of these provisions, the commissioners were directed to report their surveys and estimates to the next Legislature.

Under this law the canal commissioners employed David S. Bates, another engineer having had much experience on the Erie canal, to make surveys and estimates. From the summit level he ran several lines to the north, intersecting the Erie at Utica, Whitesboro or Oriskany. The route from Utica was 95 miles long; it had a total rise and fall of 1,009 feet, requiring 114 lift-locks. Mr. Bates concluded that reservoirs would be necessary and his estimates of cost by the routes terminating at the various points were as follows, being exclusive of damages: at Oriskany, \$1,030,502; at Whitesboro, \$979,359; at Utica (Miller's basin), \$992,307; at Utica (Huntington's basin), \$983,995. The canal commissioners also examined the routes personally; they visited the sources of water-supply and collected data concerning the probable revenue. They reported^a their findings to the Legislature of 1830, stating that they had not arrived at such conclusions as would justify them in proceeding with the work of construction. Concerning the water, they did not doubt that a sufficient supply could be obtained by resorting to reservoirs, without taking the waters of either Oriskany or Sauquoit creeks, but they thought that the cost would exceed a million dollars and estimated the probable tolls at less than the interest and annual expenses. The Assembly committee on canals rendered an unfavorable report at this session.

Imbued with the hope that their efforts would meet with final success, the people renewed their appeals to the Legislature in 1831 and again in 1832. In the former year the measure was defeated in the Senate, and in 1832 a bill was passed by the Senate, but was adversely reported by the Assembly committee.

^a*Assembly Documents*, 1830, No. 47, pp. 7-42.

The Legislature of 1833 again found the question before it. The Assembly committee rendered a most favorable report.¹ The members of this committee did not entertain any doubt concerning an adequate water-supply, this difficulty seeming to have been settled, nor did they apprehend that more than one million dollars would be needed to complete the canal. The report gave their estimated annual cost of superintendence and repairs at \$87,916. Against this was quoted the revenue as calculated by the canal commissioners in their report to the Legislature of 1830, which was \$34,512. But the tolls estimated by the advocates of the canal amounted to \$126,821. The report called attention to the fact that the canal commissioners had made a very important omission—the article of coal. Although the use of coal was still something of an experiment, the report anticipated *its* increasing consumption and predicted that the natural consequence of placing this article on the market would be this increased consumption. The Delaware and Hudson canal was cited as an example. This canal had been completed through private enterprise in 1829, connecting the coal fields of eastern Pennsylvania with the Hudson river for the purpose of carrying coal. The company was then operating the canal successfully and the stock was quoted at thirty per cent above par. It is interesting to observe that in 1859, when coal had come to be quite generally used and the subject of extending the Chenango canal to the Pennsylvania line was being agitated, the tolls to be derived from carrying coal formed more than half of the expected revenue. The report concluded with a recommendation for building the Chenango canal.

At last success for the canal advocates was assured. On February 23, 1833, the Legislature passed an act (chapter 32) authorizing the construction of the canal “from Binghamton, in the county of Broome, up the valley of the Chenango river, to its head waters, and thence by the most advantageous route, to the Erie canal, without taking any of the waters of the Oriskany or Sauquoit creeks.” The act further read: “The said commissioners, in determining the route and termination of the said canal at the Erie canal, shall be influenced by a regard for economy, public utility, and the relinquishment of damages, and the

¹*Assembly Documents, 1833, No. 26.*

amount of gifts, grants and donations," and continued: "The canal shall be constructed of the same width and depth as the Erie canal; and the locks shall be made of wood, supported by stone walls, . . . unless the said commissioners shall deem locks of a different construction, cheaper, and more useful." The commissioners of the canal fund were authorized to borrow a sum not exceeding one million dollars for the construction of the waterway.

When the people learned that the canal bill had become a law, there were joyful demonstrations throughout the Chenango valley.

One of the chief causes for the passage of the bill can, unquestionably, be ascribed to the attitude of Governor Marcy, who, in his annual message to the Legislature of 1833, favored the canal. After reviewing briefly the repeated efforts for this object and the differences of opinion concerning its cost and revenue, he committed the subject to the Legislature to decide whether it came within the rule which he had laid down as justifying, in his judgment, the construction of any public work. He said in conclusion: "I commend this proposed work to your favorable notice, with the expression of a strong desire that its merits may be found such as to induce you to authorise its construction."⁸

This rule which the Governor referred to as justifying the construction of any canal is worth noticing, as it may fairly be considered to represent public opinion at that time. It will be recalled from our study of the Erie canal enlargement, that in this same message Governor Marcy had warned the Legislature of the danger of beginning large public enterprises without a sound financial policy. Preceding the last quotation, the Governor had enunciated his rule. Speaking of any proposed canal, he said: "If the revenue promises to be sufficient to keep it in repair when finished, to defray the expenses of superintendence and the collection of tolls, and to meet the claims for interest on the capital expended, sound policy requires that it should be constructed. Even if a less favorable result should be anticipated for a few years, the question of authorizing the construction of a public work may yet be very properly enter-

⁸*Senate Documents*, 1833, No. 1, p. 16.

tained, . . . Improvements that will ensure these results at the time of their completion, or shortly thereafter, should inspire no dread that a general burden will be cast upon the State, to discharge the debt created for their construction; because the gradual growth of the adjacent country, and consequently the extension of the trade, will increase the revenue, until there will ultimately be a surplus to be applied in redemption of the debt contracted on their account.”⁹

The canal commissioners, on April 12, 1833, appointed John B. Jervis, as chief engineer on this canal, and on September 27, of the same year, he reported to the commissioners the results of his surveys and estimates, which had been completed from the village of Sherburne north to the Erie canal, the route from Sherburne to Binghamton having been decided upon from former surveys. North of the head waters of Chenango river surveys were made along nine separate routes, which terminated in the Erie canal at Utica, Whitesboro, Oriskany, Rome, Durhamville and the west side of Oneida creek. “The subject of location,” said the commissioners, “had excited great solicitude with the inhabitants residing in the vicinity of the several routes, and in the valley of the Chenango. This was manifested by oral and written communications, by relinquishments of damages, and by donations.”¹⁰ The engineer, in his report, also calculated for several artificial reservoirs to be used, in addition to the Chenango river, in providing a sufficient water-supply for the canal. After personally examining each of the routes, the commissioners adopted the line passing down the valley of the Oriskany and Sauquoit creeks, and terminating at the Erie canal near the village of Whitesboro. The locks were designed to have wooden chambers, supported by a dry wall of stone masonry on the sides, excepting the portion at the head of the lock from about eight feet below the upper gates. This part of the wall, in connection with that which formed the breast of the lock, was to be laid in hydraulic cement. The three combined locks at the falls of the Oriskany were to be of masonry, hammer faced, laid in hydraulic cement.

⁹*Senate Documents*, 1833, No. 1, p. 15.

¹⁰*Assembly Documents*, 1834, No. 55, p. 28.

During the fall of 1833 contracts were let on the northern portion of the canal. The estimates made for this part of the canal indicated that the total cost would be nearly twice the amount which the Legislature had authorized the commissioners of the canal fund to borrow, but the canal commissioners, with but one dissenting member, interpreted the act to direct the construction of the canal without fixing a limit to the cost.

On March 24, 1834, the Legislature passed an act (chapter 46) authorizing a change of location of the northern terminus of the canal, so that it would join the Erie at Huntington's basin in the City of Utica, upon the condition that satisfactory security could be obtained for paying into the treasury of the State the difference in cost between the two routes.

This action was the result of petitions from the citizens of Utica, offering to pay this difference in cost, large public meetings having been held in Utica for discussing this project. On April 21, 1834, "the acting Commissioner," said the commissioners' report, "received a bond in the penal sum of \$80,000, duly executed and conditioned according to the act entitled 'An act to change the location of the northern termination of the Chenango canal.'"¹¹ Accordingly new contracts were entered into on the changed location and operations were actively begun throughout the portion under contract early in the spring of 1834, many of the materials having been delivered during the previous winter.

The act which directed the change of location empowered the commissioners to enter into new contracts and to adjust the damages suffered by reason of the change. Five of the contractors had already commenced operations and had incurred considerable expense. They were allowed \$3,641.46 compensative damages.

As previously stated, this act authorized the change of location upon the condition that Utica should pay the difference in cost, naming the sum of \$38,615 as that difference. In 1835 an act (chapter 309) was passed, directing Utica to raise \$41,000 by tax to pay this amount. The tax was assessed, but before it was collected, citizens of Utica petitioned the Legislature to surrender, without payment, the bond of \$80,000, which individuals had

¹¹*Assembly Documents*, 1835, No. 85, p. 31.

given as security for the city's pledge. The legislative committee, after exhaustively considering the matter, concluded: "But upon a view of the whole subject, the committee are of the opinion that the canal ought originally to have terminated at Utica; and that it would be injustice to require her to pay for such advantages as have been freely and properly given to other cities."¹² Probably the matter rested there, for the financial reports give no evidence of the sum having been paid into the treasury of the State. Proceedings of a similar character were instituted on behalf of those public spirited residents of the town of Sherburne who had made their written agreement to pay the sum of \$10,890, on condition that the canal should pass through the Forks, on the east side of the river, to the village of Sherburne.

Notwithstanding the magnitude of the undertaking and the difficulties encountered, the time fixed by contract for its completion—October 15, 1836—saw the canal so nearly finished that water could be admitted, although it was not opened for navigation till the ensuing spring. The canal commissioners reported that it was necessary to build seventeen and a half miles of feeders and seven reservoirs; that the structures on the canal were as follows: 114 composite and two stone lift-locks; one guard-lock; 19 aqueducts; 52 culverts; 21 waste-weirs; 56 road bridges; 106 farm bridges; 53 feeder bridges; 12 dams, and 11 lock houses.¹³

The work of construction had begun in the spring of 1834 and at that time circumstances favored the contractors. Laborers were plentiful and wages about eleven dollars per month, for common canal labor; hay and coarse grain were abundant at ordinary prices. It seemed quite certain that the contracts would be carried out on time and at a profit to the contractors, despite the fact that many of them had taken the work at figures below the engineers' estimates. The contractors for the excavation of the summit level progressed well with their work and made provisions for its continuance during the winter with a force of about five hundred men. The spring of the following

¹²*Assembly Documents*, 1836, No. 88, p. 5.

¹³*Assembly Documents*, 1837, No. 73.

year was unfavorable, work not beginning until May. Conditions became less favorable; coarse grain, hay and provisions of every kind became scarce and advanced rapidly in price. These discouraging conditions continued throughout the year, the prevailing prices for provisions being much above the ordinary rates which had prevailed for several years. Many of the laborers, who had obtained employment on the canal at the outset, left for Indiana and other states where common labor was in great demand and wages unusually high. The construction of the Utica and Schenectady railroad, which began at this time, also attracted many others. In June work along the entire length of the canal was pressed vigorously forward, but owing to the scarcity of laborers, wages advanced to thirteen, fourteen and in some instances to fifteen dollars per month, for ordinary labor. In consequence of these unforeseen obstacles, the contractors were in danger of being required to complete their contracts at a loss to themselves; had not the Legislature, by a series of acts extending over a period of several years, provided for them gratuities equaling twenty per cent of their original contract prices.

The Chenango canal was practically completed during the month of October, 1836, as the contracts required, but navigation did not begin thereon until early in May, 1837. Although navigation began under unpropitious circumstances, it was tolerably well sustained throughout the season. Being a new canal it was considered liable to interruption. Nearly all of the surplus products of the country along the line had already been taken to market and the amount of merchandise taken into the country was much less than usual. Not a single boat was owned on the line of the canal. On account of these circumstances the revenue derived from tolls amounted to only \$10,812.72 for the first season.

The next year a very great improvement was recorded. The commissioners reported that navigation on the canal had been well sustained, and that the structures were evidently in a sound and good condition. The reservoirs, with their walls, culverts and other appendages, appeared permanent and fully answered the purposes for which they were designed. The receipts from tolls amounted to \$20,430.87.

The people of that region felt that the revenues, although largely increased, had fallen far short of the amount attainable, in consequence of the high rate of tolls established on this canal. Accordingly a number of citizens of Binghamton presented to the canal board a petition praying for a reduction of the rates and for an equalization of the tolls with those on the Erie. In reporting¹⁴ to the Legislature, the canal board declared that the rates of toll fixed by law on the Chenango canal had a tendency to diminish the amount of freight transported, diverting it to the Susquehanna and so to the markets out of the state. Lumber felt this distinction in rates probably more than any other article. The board reported unanimously in favor of granting the petition, and the Legislature responded by enacting chapter 262 of the laws of 1839, which provided for the same tolls on the Chenango as should be charged thereafter on the Erie canal.

A law was passed in 1838 which ordered a survey for extending the canal to the Pennsylvania line. As the history of that project is given in another chapter, no further reference is needed here.

In view of the early doubts concerning an adequate water-supply, the most important item to record for the next few years is a statement by the canal commissioners that the reservoirs had furnished not only an abundance for this canal, but had contributed essentially towards keeping up a supply for the Erie, water having been drawn for this purpose at frequent intervals, generally as often as two or three times a week, for a period of from six to nine hours.

In February, 1842, occurred the first severe breaches in the canal. These were caused by a freshet, which broke down dams, carried away banks and brought immense quantities of earth and gravel into the canal.

The legislative enactment of this year, known as the "Stop law," which terminated active operations throughout the state on works of public improvement, affected this canal but little, as the structures had been so recently completed as to need few repairs.

In April, 1843, occurred a very serious injury. The Kingsley brook reservoir, one of the most important of the system, was so

¹⁴*Assembly Documents*, 1839, No. 343.

damaged by a flood as to require about \$8,000 to make repairs. Believing that this source of supply could be dispensed with, the commissioners failed to restore it,—an act which they deprecated in their next annual report, but many years passed before the reservoir was again brought into use.

Nothing of special importance occurred for a number of years. In 1849 a new stone dam was built for the West branch feeder. The canal commissioners' reports for several years had been calling attention to the fact that the mechanical structures, being of wood, were fast nearing a condition to require heavy expenditures for repairs. In 1849 the commissioner said that, with the exception of its structures, the Chenango was the best constructed canal in the state. By 1850 extensive repairs to structures had begun; many locks were thoroughly overhauled and others provided with new gates; the aqueduct over the Chenango river at Greene was rebuilt, also a number of bridges. These repairs were continued until 1855, when the new system of making repairs by contract went into effect on this canal. In 1853 a new trunk was built for the aqueduct two miles above Oxford; in 1854 about eight miles of towing-path was raised and repaired; in 1855 twenty-seven thousand feet of new docking was put in on section No. 3.

On December 31, 1855, State Engineer John T. Clark and Canal Commissioner Henry Fitzhugh reported concerning a complaint to the canal board by owners of water-power on the Oriskany creek, that its waters were being diverted for the Chenango canal. The report¹⁵ stated that, as the law authorizing the canal had stipulated that no water should be taken from Oriskany creek, great care had always been exercised to keep within this restriction, by diverting neither this stream nor its tributaries; that a personal examination had failed to reveal any violation of this injunction, except possibly one small stream; that the contention that the supply was diminished by intercepting streams was more imaginary than real; that the waste and leakage exceeded all possible amounts from visible and invisible springs and streams, and that the petitioners were not entitled to relief.

¹⁵*Assembly Documents*, 1856, No. 100, pp. 71-72.

The canal commissioners stated in 1855 that they had entered into contracts for all necessary repairs to this canal for a period of five years for the annual cost of \$26,675. This change of system led to a comparison of expenditures. The cost for maintenance in 1837 had been \$19,508, or \$201 per mile, in 1855 it was \$49,187, or \$486 per mile. The tolls showed no such increase. In 1837 the sum of \$10,812.72 had been collected, and in 1855, \$20,036.66, with a maximum of \$32,272.80 in 1848.

In 1857 chapter 105 supplemented this change of system by empowering the contracting board to appoint a resident engineer in the place of the existing superintendent of repairs. Under this plan the Chenango canal constituted residency No. 5, and in April, 1857, the canal was placed under the charge of Resident Engineer Ogden Edwards.

In this year the commissioners reported that the new system was working satisfactorily, excepting on one section. Here were experienced difficulties which foreshadowed the abuses that later brought the system into such disrepute. The contractor was so dilatory in making needed repairs, that the commissioner ordered the resident engineer to take immediate charge and subsequently the contract was declared abandoned. Because of the contractor's neglect, a thorough bottoming out of the prism, an overhauling of the structures and a puddling of the banks was necessary during the next year, and this was done by an agreement to perform the work at specified unit prices.

In 1857 the engineer recommended the rebuilding of the forty-five bridges, replacing Burr with Whipple trusses. He also called attention to the need of a weigh-lock on this canal to protect the State from frauds.

In reporting for 1859, the resident engineer gave an account which is worth quoting, as it describes briefly how existing conditions in the canal had developed. He said:

"The size of the prism of the canal when constructed, was 26 feet on bottom, side slopes 2 to 1, surface water width 4 feet above bottom, 42 feet. The locks were 15 feet in width on bottom, and 16 feet on top, and 90 feet length of chamber; the other structures in the same relative proportion, so that two boats drawing $3\frac{1}{2}$ feet of water (14 feet wide, according to law) could pass each other.

"It was the duty of the officers to keep the canal in this form, but instead, it has been allowed to fill up in the prism from year to year, and the surface of water raised by putting boards on the aqueducts, waste weirs, &c., and raising the lock gates until the surface is very near 5 feet above bottom. The consequence of this is, that the water runs over the lining of the impermeable wall built on the inside of the banks, and renders the loss of water immense, which is very disastrous to navigation in dry seasons.

"The banks have never been kept to a corresponding height, on the contrary have been left to be worn down, so that danger of breaks in a sudden rise is imminent. The boatmen and forwarders have kept pace with this state of things; every new boat is built a little larger, wider, and deeper. The raising of the water has given increased bottom width, and a greater depth, so that a boat is not considered loaded, unless it can carry from 100 to 110 tons of freight. When the canal was built 65 tons was considered a good load. One difficulty exists in running large class boats on a small canal; the locks are on the composite plan, wood chambers, stone at head and foot. The frost and water, by 20 years action, have pressed in the sides and wings of some of them to 14 feet, 6 inches; so that modern boats 14 feet 6 inches and 14 feet 8 inches in width, find trouble in getting through. This is one of the great causes of complaint by persons navigating this canal, and some remedy should be applied to correct it. There is another difficulty with boats which are not fit to run, having served their time, become decayed and worthless, when a rush of freight comes, are gotten up and loaded in some way, and after going a short distance sink, and hinder navigation for days. The remedy for this is easy, by having the collectors refuse them a clearance.

"The farmers and persons living upon the line of canal have been constantly encroaching upon the banks and lands of the State, until in many places the fences are so close to the inner angle of the towing path that it is almost impossible to pass two teams, and they have enjoyed the privilege so long with such impunity, that they consider their rights infringed upon if re-

quested to remove the obstruction, and threaten prosecution to any one interfering with their fences.

"About two and a half years since a circular was prepared under the direction of the acting Canal Commissioner, to the effect that all fences and other obstructions on the towing path side of the canal, should be removed to the limits of the State property. Nearly all agreed that as soon as their fences required repairing or rebuilding, they would do so, but there is no abatement of the nuisance, and the remedy now to apply is to direct the contractors to remove the fences, &c., and hold them to pay the expense. If the property is not worth enough, sue and recover damages against the land owners."¹⁶

The engineer reported in 1859 that the masonry in the aqueduct across the Chemung river near Sherburne was so dilapidated that there was danger of the structure falling into the river. At the same time he took occasion to say that nearly all of the masonry on the canal was a failure; a poor quality of stone had contributed, but the cement had nearly all disappeared. This aqueduct was rebuilt in 1861-2.

In his report for 1861, Mr. W. H. H. Gere, then resident engineer on this canal, related an experience with the repair contractors, which may be mentioned on account of its legal question. Realizing that the contractors had greatly neglected their work, Mr. Gere ordered them to proceed within a certain time and with a specified force of laborers. Upon their failure to comply, the contracting board canceled their contracts. Thereupon one contractor brought suit against the commissioner. This was the first case to be brought before the courts, involving the legal right of the contracting board to annul a repair contract.¹⁷

By 1862 the need of an increased water-supply was felt. Both the commissioner and the division engineer recommended the reconstruction of Kingsley brook reservoir, which had been out of use for nearly twenty years. These officials also advised repairs to the locks, the commissioner declaring that, unless more than one hundred of them were soon rebuilt, navigation must be abandoned, and the division engineer recommending an annual appropriation of \$25,000 until all were renewed. During the

¹⁶*Assembly Documents*, 1860, No. 51, pp. 41-42.

¹⁷*Assembly Documents*, 1862, No. 9, pp. 85-88.

winter of 1861-2 one lock—No. 89—had been rebuilt on a new plan. The wings and recess walls were made of dressed masonry, and the chamber walls were laid in cement, but, instead of the usual lining of plank on the sides, oak fenders were anchored into the masonry at intervals of about four feet. The cost was only \$5,043.94, being much less than for the old style of "composite" lock, and the structure was considered "quite as good for all practical purposes as locks of dressed stone."

In 1863 the rebuilding of six locks was begun as an item of ordinary repair, no special appropriation having been made. The condition of the Chenango canal was becoming extremely serious. The division engineer said in this year: "This canal, with its 116 locks, is in the poorest condition, (so far as its capacity for business is concerned), of any of the canals in this division. It can only be made useful by the strictest enforcement of the repair contracts, together with a steady and uniform annual expenditure of at least \$50,000, for the renewal of its locks and other important structures."¹³

The reconstruction of Kingsley brook reservoir was begun in 1864. In the spring of this year also, a large amount of material was removed from the bottom of the canal, so that the channel was in excellent condition throughout its length. The commissioner made the gratifying statement that the preceding four or five years had shown a gradual increase of business, and that during this season at least a hundred more boats had been in motion than ever plied upon this canal before.

By 1865 eight locks, Nos. 86, 87, 89, 99, 100, 103, 104 and 109, had been rebuilt and six more advertised for the following winter. In March of this year occurred a freshet that was described as the greatest ever experienced in central and southern New York. This seriously damaged the canals in that section, especially the Chenango. The waters of Chenango river, rising several feet higher than ever before known, poured over and through the southern portion of the canal, completely inundating the whole, demolishing many of its structures, sweeping away about three miles of its banks, tearing off the top of most of the towing-path and nearly destroying the Oxford and Stratton feeder dams.

¹³*Assembly Documents*, 1864, No. 179, p. 57.

By great diligence repairs were made so as to open the canal about the first of June.

The regulation adopted this year, not allowing boats to pass the locks between sunset and sunrise, without special permission, was said to have worked to the entire satisfaction of the canal officials, and to have resulted greatly to the advantage of boatmen and forwarders as well as to the canal interests.

As related in a chapter devoted to that subject, the Chenango canal extension was begun in 1865.

The Kingsley brook reservoir was completed in 1867, greatly facilitating navigation. Through a scarcity of laborers this work had progressed slowly. Another cause of delay was a change of plan. When the dam was constructed originally, it was raised to about half of its intended height, making the flow-line fourteen feet lower than was planned. In beginning its reconstruction in 1864, only repairs to the breaches were contemplated, but later it was deemed economical to raise the dam to the height originally designed. This change increased the cost to a small extent, but added over one hundred per cent to the capacity of the reservoir.

Six more locks, Nos. 56, 60, 61, 77, 78 and 79, had been rebuilt by 1867, at a cost of \$62,465.29, and material delivered for five others, Nos. 52, 55, 65, 80 and 81. These were completed during the next year, but notwithstanding these efforts the commissioner reported: "The old locks are failing faster than means for their reconstruction are provided."¹⁹

The year 1869 was unfavorable for the canal, as twenty-five locks were damaged during the season. Reporting for this year, the commissioner said: "Where dilapidation abounds, and will abound till a vast expenditure of money is made, it cannot truthfully be said that the condition of affairs is satisfactory."²⁰

On March 17, 1868, another freshet occurred on this canal, causing considerable damage. The Stratton feeder bulkhead was carried away and its waters suddenly emptied into the canal, to its serious detriment. The Chenango river broke into the canal at Chenango Forks, sweeping nearly to Port Dickinson, breaking the banks of the canal and filling the prism in many places.

¹⁹*Assembly Documents*, 1869, No. 4, p. 47.

²⁰*Assembly Documents*, 1870, No. 4, p. 42.

These breaks were repaired with such expedition as to prevent all but slight detention to the opening of the canal.

In consequence of damages to Capron aqueduct, brought about through very high water in Sauquoit creek, navigation was interrupted for a period of ten days in 1869. Every dam on the stream above was carried away and much of the debris, including a house, was deposited at the entrance to the aqueduct. The walls of the aqueduct were undermined and one side of the trunk destroyed. This break occurred July 8, and interrupted navigation until the eighteenth. The damage was so serious that the aqueduct was rebuilt during the next year, another span being added, which gave twenty-five per cent more capacity.

Chapter 55, Laws of 1870, abolished the contracting board and the system of repairing the canals by contract, not invalidating existing contracts, however, but providing that contractors might surrender contracts at their option. On this canal the contractors on sections Nos. 1 and 3 surrendered their contracts to the canal board on April 15, 1870, and the section superintendents assumed general control. On section No. 2 the contractor continued his work as usual. Three more locks, Nos. 18, 19 and 22, were rebuilt during 1870.

From this time forward the reports of canal officials concerning this waterway are chiefly accounts of the dilapidation existing throughout its length and predictions of enforced abandonment, unless some new policy should be adopted. In the absence of any appropriation or legislative direction, the officials were much embarrassed in determining what course to pursue. Former reports had repeatedly called attention to the deplorable condition of the structures, and yet nothing had been done to authorize their reconstruction or to pay for it, except as an ordinary repair. The officials felt it their duty to keep the canal in operation, and knowing that, if a lock or aqueduct should fail utterly during the open season, navigation would be stopped for a long time, they were forced to adopt the makeshift policy of patching and bolstering. Slowly the locks were renewed from the ordinary repair fund, till in 1872, thirty-one—about a quarter of the whole number—had been rebuilt on the improved plan of cement masonry and fenders. In this year an appropriation (chapter 850) had been made for two locks, and during the year

nine—Nos. 7, 17, 27, 47, 51, 101, 107, 108 and 110—had been rebuilt.

The work of extending this canal from Binghamton to the Pennsylvania line, as told in another chapter, was still being prosecuted, and the prospect of this added portion strengthened the desire for preserving the older part in a navigable state, inasmuch as a large sum had been expended on the new channel which would be practically wasted if the whole length were not in operation. But it began to be realized that the canal must be abandoned. In 1871 the canal commissioner of the middle division pointedly voiced this sentiment by saying of some of the lateral canals that, although they had originally served their purpose in developing valuable territory and opening new markets, they had been almost wholly superseded by railroads which now threatened their only remaining business—the coal trade. The commissioner said that he had considered it his duty to maintain navigation in these canals at whatever cost, but the sum for ordinary maintenance had been so augmented by the amounts for rebuilding structures that the diminished tolls were less than three per cent of the expenditures. He concluded by saying that, if for any cause commerce had deserted these once useful waterways with no rational hope of returning, the question of a proper policy was forced upon the State, which must be met.²¹

In 1872 the Legislature gave Binghamton the right (chapter 787) to use as a street that portion of the Chenango canal lying between the north end of Prospect avenue and the south side of Susquehanna street.

During 1873 and 1874 expenditures, being confined to the absolutely necessary repairs of breaches and patching of locks and bridges, were much less than for preceding years, despite the serious damage of a flood in 1873, which the auditor had asserted would cost hundreds of thousands of dollars to repair. In line with this economy, the canal was placed in charge of one superintendent instead of three, by resolution of the canal board on January 21, 1874.

At the election of 1874 the people approved the constitutional amendment, which permitted the sale, lease or other disposition

²¹*Assembly Documents*, 1872, No. 20, pp. 95-96.

of the canals of the state, except the Erie, Oswego, Champlain and the Cayuga and Seneca. As another chapter is devoted to the study of the various steps in abandoning the lateral canals, together with the causes which led to this action, nothing need be mentioned here, except the conclusions arrived at concerning this particular canal by the people appointed to consider the subject.

The Legislature of 1875 directed the canal board to investigate and report upon the disposition to be made of the lateral canals. The report to this request, rendered in February, 1876, was so unsatisfactory and inconclusive as to necessitate the appointment of a special commission by the Legislature of this year. This report,²² however, although favoring the abandonment of laterals in general, declared the necessity of retaining the reservoirs and a portion of the Chenango canal as a source of water-supply for the Erie.

The commissioners appointed by the Legislature of 1876 (chapter 382) made a thorough investigation of conditions along the lateral canals, visiting the localities and taking testimony from people concerned in the traffic as well as from those having charge of the maintenance. Their report²³ declared that the business of the Chenango canal was gone and that the structures were so dilapidated as to be able to last but a few years longer, with a possibility of failure at any time, which only a vast expenditure could repair. Accordingly they recommended that the whole canal—both the existing channel between Utica and Binghamton and the uncompleted extension to the state line—be abandoned, excepting a portion in Utica for the accommodation of the insane asylum and the part needed to supply water to the Erie. Speaking of this water-supply, the commissioners said:

"All the engineers connected with the canals insist upon retaining the various reservoirs supplying the Chenango canal, whose waters flow north as feeders for the Erie.

"Your commission fully concur in this view of their necessity, and hereby recommend that all that portion of the summit level of the Chenango canal which extends between Solsville and the point at which the waters from the reservoirs are received,

²²*Assembly Documents*, 1876, No. 46.

²³*Assembly Documents*, 1877, No. 30.

shall be retained as a conduit for the water; that at Solsville a permanent bulk-head shall be constructed, and the water be discharged through it into Oniskany creek, and thence conducted into the Rome level of the Erie."²⁴

Chapter 404, Laws of 1877, provided for the abandonment of the canal, including the extension, south of the stone culvert in the village of Hamilton, after May 1, 1878, and for the sale of this portion after the close of navigation in 1878, but stipulated that no reservoir, feeder or property of the State north of that culvert should be sold, nor Madison brook reservoir, Kingsley brook reservoir, Woodman's pond and Leland's pond and the feeders from them, and that the waters necessary to feed the Erie canal should not be diverted, but a supply for the Utica asylum should be maintained.

In 1877 the canal commissioner, whose office also was on the eve of abolition, added a final wail of complaint to the long series of forebodings concerning this canal, saying: "This rather 'worthless ditch' has been a source of much perplexity, and an expense of nearly \$4,000 for about six weeks' navigation, in October and November, 1876, and maintenance of bridges and other work necessary during the fiscal year of 1877. . . . There was no navigation upon this canal during the calendar year of 1877, for the reason that no dependence could be placed on the various dilapidated structures holding out for a week without expending an amount of money in its preparation unwarranted by its business of previous years, or prospects of the future. . . .

"It will be a good riddance for the State when the time arrives for the sale of what is left of the old Chenango canal."²⁵

In 1878 (chapter 391) Binghamton was authorized to take possession of that portion of the canal lying within the city limits and to fill in and grade this for the purpose of forming a public street, to be known as State street. The city was also empowered to remove all encroachments upon the canal lands, bringing legal action for recovering possession. In 1880 this law was amended by chapter 190, which gave to the city the power of removing summarily and without legal process these encroach-

²⁴*Assembly Documents*, 1877, No. 30, p. 6.

²⁵*Assembly Documents*, 1878, No. 12, p. 101.

ments, and by which the act of obstructing this removal was made a misdemeanor.

At the close of 1878, the division engineer reported that the summit level had been converted into a reservoir by building a permanent dam at its southern end, and turning all waters from the reservoirs into the Erie canal at Oriskany and Utica. He said that upon the portion not abandoned the locks were already so badly decayed that boats could not pass, and that this section was in fact as much abandoned as the southern part. There were 194 structures on this stretch of thirty-one miles, as follows: 82 locks, 4 aqueducts, 20 culverts, 9 waste-weirs and 79 bridges. As the canal could never be used for anything but a feeder, he recommended lowering bridge abutments and approaches to the level of the towing-path and building new bridges of only fifteen feet span, also constructing bulkheads to control the water, when lock-gates should fail. This work was gradually performed. On May 6, 1882, the materials in lock walls (excepting lock No. 1, at Utica, and Nos. 76 and 77, at the ends of the summit level) were sold at public auction, the State reserving the lower six feet of the walls.

The State found no purchasers for any great extent of the abandoned canal. The law authorizing its sale was amended in 1879 by chapter 522, which fixed another date of sale—as soon after January 1, 1880, as the canal board deemed best. Final disposition was made in 1880, by chapter 551, which granted titles to owners of adjoining lands, except portions in Norwich, Oxford and Greene, which were given to those villages for public uses.

The only parts of the canal now remaining open are a short piece in Utica between the Erie canal and Fayette street and the old summit level, extending for about five miles from a dam across the canal at Sollsville to another dam at lock No. 77, the remainder having been released to villages, railroads or adjoining owners. The open sections are now counted as a part of the Erie canal system.

CHAPTER XVIII.

THE CHENANGO CANAL EXTENSION.

From the first survey in 1838, through the work of partial construction, to the final abandonment of the whole Chenango route.

For the purpose of making connection with the Pennsylvania canal system, and thus to complete a route to the vast coal fields in that state, the New York Legislature, on April 18, 1838, passed an act (chapter 292) directing the canal commissioners to cause a survey to be made from the termination of the Chenango canal at Binghamton, along the valley of the Susquehanna, to the State line near Tioga Point, at the termination of the North Branch canal of Pennsylvania, and to cause an estimate of the cost of this continuation to be made.

Accordingly the canal commissioners appointed Joseph D. Allen, a civil engineer, who had had considerable experience in the service of the State, to superintend the survey. He made a report of his work to the canal commissioners on December 5, 1838, which was embodied in a report of the canal commissioners submitted to the Legislature, January 26, 1839.

Surveys were made by Mr. Allen on both sides of the Susquehanna river and three estimates were prepared, two on the northern route and one on the southern. The termination of the Chenango canal in Binghamton was at the junction of the Chenango and Susquehanna rivers. By a lock of twelve feet lift, the canal entered the east side of the Chenango at its mouth, as it flows from the north into the Susquehanna. To continue the canal along the north side of the Susquehanna, the crossing of the Chenango became necessary and two plans were devised to accomplish this; one by carrying the canal over on an aqueduct, the other by building a dam across the river to afford sufficient depth for floating boats. On the route along the south side of the Susquehanna river, the plans provided for carrying the canal across the Susquehanna on an aqueduct. The act called for a

survey to connect with the North Branch canal of Pennsylvania, but as this canal was built only to a point four miles from the State line, the surveys were carried to such points on the State line as would afford good connections with the North Branch canal.

The dimensions of the canal and the character of the mechanical structures were, in general, designed to be the same as those in use on the Chenango canal. Composite locks were proposed, having walls of rubble masonry laid in hydraulic cement throughout, and lined in the chamber with timber and plank. In this respect the plans varied from the locks used on the Chenango canal; the walls of those locks being laid in hydraulic cement only to a point eight feet below the upper gates, and the remainder being dry. Liberal provision was made for lining and puddling the banks and bottom of the prism, as much of the soil appeared to be of a porous character.

The north line (passing the Chenango river with an aqueduct) was $39\frac{1}{4}$ miles long, had seventy-seven feet of lockage and was estimated to cost \$788,149.68.

The north line (passing the Chenango river with a dam) was forty miles long, had sixty feet of lockage and was estimated to cost \$765,683.09.

The south line was $38\frac{1}{8}$ miles long, had seventy-four feet of lockage and was estimated to cost \$770,467.35.

No recommendation accompanied the report.

During this session of the Legislature, 1839, several petitions were received praying for this extension of the Chenango canal. The Assembly committee, to which were referred these petitions, reported in favor of the project, saying that not only the wishes and necessities of the inhabitants of that particular section through which the canal would pass, but the interests of the whole State required that immediate steps be taken to form a connection between the two greatest and most extended chains of internal improvements in the world, a connection which would unite the waters of the Hudson, St. Lawrence and the upper lakes with the Susquehanna and Ohio rivers and the Delaware and Chesapeake Bays. The report also called attention to the fact that the Chenango canal had been built with the view of ultimately reaching the rich mineral fields of Pennsylvania.

On April 9, 1839, Governor Seward informed the Legislature that a committee of the Pennsylvania Senate, consisting of the Speaker and two members of that body, was at Albany to confer in regard to completing water communications between the canal systems of the two States by extending either the Chenango or Chemung canals. Pennsylvania was about to complete the North Branch canal to the State line and desired this connection with New York canals that the interchange of those great staples, coal, iron, plaster and salt, might be mutually beneficial.

This conference resulted in the passage of an act which ordered the survey of a route from the terminus of the Chemung canal at Elmira to the State line near Tioga Point. In later years the Junction canal was built by a private company between these points, the account of this enterprise being told in a chapter of this volume devoted to that subject. However, no immediate, tangible results along either line followed this conference.

In 1846, by an act (chapter 259) the Chenango Junction Canal Company was incorporated to build a canal of such dimensions as the officers of the company should decide, from the termination of the Chenango canal at Binghamton to the State line near Athens, Pennsylvania. The capital stock was one million dollars. This company, however, never accomplished anything.

Nothing more seems to have been done toward constructing the canal till the Legislature of 1859 (chapter 88) required the State Engineer and Surveyor "to make a full examination of the survey of the Chenango canal from Binghamton to the State line of Pennsylvania, near Athens, made in pursuance of the act of April 18, 1838, and reported to the canal commissioners by Joseph D. Allen, civil engineer, December 5, 1838, and if necessary to cause a new survey to be made, and to estimate the cost of constructing said canal, including land damages, and the probable increase of business on the canals of this state from such extension (from coal or other freight) and report the same to the next legislature, at the opening of the session thereof."

Pursuant to this act, Van R. Richmond, State Engineer and Surveyor, appointed Orville W. Childs to the general supervision of the surveys, estimates and other duties involved. On January 10, 1860, the State Engineer sent to the Legislature the report of his investigation.

As a railroad had been located on the north side of the Susquehanna since the survey of 1838, a line on the south side was adopted, similar in many respects to that proposed by Mr. Allen. A new survey was made and the estimated cost of the canal, including engineering, land, and land damages, and all other contingencies, was \$829,488.21. The length was 38.48 miles, and the total lockage was seventy-one feet. The estimates were based upon the same dimensions of prism and banks of canal, plan of mechanical structures, and general character of work, as was adopted in the construction of the Chenango canal.

The Susquehanna river was to be crossed at Binghamton in the pool formed by a dam. Of the connection with the North Branch canal, Mr. Childs says:—

“The termination of the line, as surveyed for this extension, is directly at the south margin of the river, at a point on the State line convenient for locking into the pond that may be formed by constructing a dam across the Susquehanna, a little above the northerly end of the village of Athens.

“The village is situated on a narrow strip of land, extending down between the Susquehanna and Chemung rivers, which unite about three-fourths of a mile below the village. The North Branch canal is inland for several miles below and opposite the village, and is on the west side of the Chemung river. Proceeding northerly, it passes into the pond of a dam now extending across the Chemung nearly opposite that proposed to be constructed across the Susquehanna. A short cut across the flat, in a natural ravine north of the village, would form the canal between the two rivers, and with a towing-path bridge across the Susquehanna, or other practicable means of crossing the pond of the dam, and the construction of a towing-path along the southerly margin of the river up to the State line, a good connection would be formed between the Chenango canal extension and the North Branch canal. This latter canal is understood to be the property of incorporated companies, whose interest in the connection of the two canals is supposed to be at least sufficient to induce them to construct this connecting link, either by the mode above suggested, or upon such other plan as they may deem best adapted to the object in view.

"The distance from the State line to the north branch canal is understood to be about (or something less than) four miles, and upon the plan above suggested, of a towing path, dam, &c., and the cut about half a mile in length across the point between the two rivers, the aggregate expense of constructing this portion of the canal would be comparatively small, and that the work will be prosecuted and the canal completed by these companies, at least as soon as that of the Chenango canal extension, very strong assurances by some of the principal officers and by the most prominent and wealthy of the stockholders of the North Branch canal, were voluntarily expressed. The importance of this connecting link to the ultimate success of the Chenango extension, will be readily appreciated, and cannot but be regarded as indispensable."¹

In studying the problem of probable increase of business on the canals of the State, Mr. Childs first points out the importance of the connections that would be made. At the northerly end, the canal would connect, through the Chenango canal, with the New York Central railroad and the Erie canal and its laterals, the Champlain, Black River, Oneida Lake and Oswego canals. At the southerly end, it would connect "with the North Branch canal, extending in a southerly direction through the State of Pennsylvania, thus forming a water communication with Haver de Grace at the head of the Chesapeake bay, and a connection with the West Branch canal, the Juniata and other canals, and with the numerous railroads diverging from it in the valley of the Susquehanna."² Also it would connect with western New York through the Junction and Chemung canals, Seneca lake, and the Cayuga and Seneca and the Erie canals.

After a careful examination of existing and probable freight traffic, Mr. Childs estimated that the increased business that would result upon this and the other State canals would be sufficient to produce an annual toll of \$40,927.68. Coal, iron ore, limestone, and lumber were considered the chief articles of transportation, with coal forming more than half the total amount. It was considered that the construction of this canal would result in materially reducing the price of coal throughout

¹*Senate Documents*, 1860, No. 6, pp. 11-12.

²*Id.* p. 12.

middle, eastern and northern New York, as well as in the vicinity of the Chenango canal and its extension.

The construction of this Chenango canal extension was authorized by chapter 115, Laws of 1863, (passed April 9) which provided that the canal commissioners should extend the Chenango canal as funds were appropriated and that the same width, depth and size of structure should be used as on the Chenango canal, except where improvements could be made without increased expense. But this act failed to provide funds for prosecuting the work, so nothing was done till the Legislature of 1864 (chapter 185) supplied funds by imposing a tax of three-sixteenths of a mill for the fiscal years commencing October 1, 1864, and October 1, 1865, \$550,000 of this tax to be used for constructing the canal. This act required that before work was begun the canal commissioners should obtain a guarantee from parties authorized to execute the same, that canal boats owned in New York State should have a perfect and permanent right to navigate the canals leading from the State line to the coal mines of Pennsylvania; it also required that the size of the locks upon the extension should not be less than those upon the Pennsylvania North Branch canal. The Comptroller was authorized to make a temporary loan, in anticipation of the tax collection, for the prosecution of the work.

As the Comptroller was prohibited by the State Constitution from making a loan unless authorized to do so by popular vote of the State, the canal commissioners could place no portion of the work under contract till funds were realized from the tax collection. In order to hasten the work, the canal board, on September 23, 1864, set apart from the extraordinary repair fund, \$6,000 for the purpose of making surveys, estimates, plans, etc., and a party under Mr. L. L. Nichols, first assistant engineer, was immediately put in the field, that the plans might be ready for letting contracts in the following spring.

"Immediately after the passage of the law (chapter 185, Laws of 1864), the Commissioner opened a correspondence with the North Branch Canal Company of Pennsylvania, which finally resulted in a compliance by that company with a requisition of the Board of Canal Commissioners, that boats from this State 'shall have a perfect and permanent right' to navigate said canal

upon the same terms and conditions as the boats of said company."³

On June 20, 1864, a bond of \$100,000 was executed by the officers of the North Branch Canal Company binding the company to complete the connection between the North Branch canal and the proposed Chenango extension. Chapter 115, Laws of 1863, required the canal commissioners to obtain this bond before beginning work.

The canal commissioner in charge expressed in his annual report his views concerning the project in the following words:

"It is the opinion of the commissioner that the great importance of this work—not only to consumers of coal, but to the State itself, in connection with the Chenango canal—would justify the Legislature in providing the requisite means for a more speedy construction than the present law seems to contemplate. If it be true, as those best advised on the subject claim, that this extension of the canal directly to the immense coal fields of Pennsylvania will assure an increased amount of shipments of at least two hundred thousand tons of coal per annum, seeking a transportation to a market through its medium, the practicability of a more speedy construction is apparent. If the foregoing estimate approximates correctness, then it is evident that what is paid by tax to construct this work will be repaid with interest to all the consumers of coal, and their number is increasing from year to year in rapid ratio."⁴

On May 5, 1865, plans for twenty-one miles of the canal were adopted by the canal board, and on June 22, 1865, contracts for the first ten miles were let. At that time the estimates for completing the whole canal amounted to \$1,524,206. The resurvey gave a length of 40.025 miles.

At the letting, held at Binghamton on June 22, a large number of contractors were in attendance, an unprecedented number of bids were received and the work was awarded at prices far below the estimates of the engineers.

It was a matter of congratulation that during the year 1865, when prices of labor and material of all kinds were excessively high, the construction of this important work could be secured

³*Annual Report of the Canal Commissioners, 1865, pp. 63–64.*

⁴*Id.* p. 64.

at prices so nearly those of former times, and it seemed highly probable that the remaining portion of the work would be let at prices fully as advantageous to the State as the ten miles already under contract.

Chapter 794, Laws of 1866, authorized the canal board to appoint a resident engineer on the Chenango canal extension, and on June 15, 1866, Byron M. Hanks assumed the duties of that position.

From the time of the first letting of contracts till September 1, 1867, the work of construction progressed steadily, and at that time about thirty miles of canal were under contract, but then the funds provided for construction became exhausted and work was suspended, some of the contracts being canceled by the canal board.

In his annual report the canal commissioner thus speaks of the stoppage of work:

"During the past year efforts have been made to complete as many sections as possible, and to leave the unfinished work in the safest condition practicable; yet the State must suffer great loss from the stoppage of the work, and the abandonment of the contracts.

"There has been a total expenditure on this canal of \$713,256.86. Of this \$510,500.04 have been expended during the year just closed.

"The engineer's estimate of funds required to complete the work now under contract, is \$489,200. It is estimated that \$500,000 will be required to construct the ten miles not under contract. If these estimates are correct, it will be necessary for the Legislature to make an appropriation of \$1,000,000 to complete the canal.

"It would seem that a great error was committed when this work was commenced, or else a still greater error was made in not providing the means to continue the work after having expended over \$700,000. If the work is to be resumed, the longer it is delayed the greater will be the damage to the State."⁵

A further appropriation having been made by the Legislature of 1868 (\$281,800 by chapter 715 and \$18,201.15 by chapter 346, the latter sum being an unexpended balance from chapter 304, Laws of 1866), the canal board passed a resolution on May 28,

⁵*Annual Report of the Canal Commissioners, 1867, pp. 80-81.*

1868, ordering the work resumed. On June 1, Charles L. McAlpine was appointed resident engineer. After remeasurements were made the work was relet on July 29, at prices considerably higher than those in the former contracts for the same work, only such part being put under contract as could be finished with the amount appropriated. No work was let south of Owego and the new contracts did not embrace as much work as was previously under contract. During 1869 and 1870 additional contracts were awarded from time to time till nearly the whole line was under contract, but owing to the small appropriations made by the Legislature, construction work was not begun on the last ten miles. The final location on this last portion of ten miles was not decided till December 8, 1869, when the canal board adopted a line which crossed to the north side of the Susquehanna in the pool of a dam at Pea Island, about two miles north of the State line.

In June, 1870, the contractors were again notified to suspend work because of lack of funds, but some of them were allowed to continue for a short time, in order to put the work in a safer condition. At that time the greater part of the canal for the first thirty miles had been completed. In May, 1871, operations were again resumed, another appropriation having been made by chapter 930, Laws of 1871, which provided that the work should be confined to the portion between Binghamton and Owego, about twenty-three miles long. As this appropriation was not deemed sufficient to complete that portion of the canal, work was prosecuted at such places as were most liable to injury from floods, and at unfinished places so as to make a continuously completed line south from the river at Binghamton.

Commissioner W. W. Wright in his report for 1871, speaking of the project, says:

"Whatever may be the commercial value of this work when finished, the State can not regard that consideration alone; but the claims of citizens whose lands have been appropriated for a canal, whereon only an unsightly nuisance has been created, must be also considered."^a

During the years 1871 and 1872 work was carried on till the appropriation was exhausted, and then finally abandoned, no

^a*Annual Report of the Canal Commissioners, 1871, p. 94.*

appropriation being made for new work after 1871, except a small amount to build farm and road bridges.

At the time of the final suspension of work it was estimated that \$160,000 was needed to complete the canal between the Chenango canal at Binghamton and Owego. The estimated cost to complete the entire canal from Binghamton to the Pennsylvania line is shown in the following summary:

Work done and to be done, under contract.....	\$2,007,095 16
Work to be done and not under contract.....	340,163 00
Total amount done and to be done.....	<u>\$2,347,258 16</u>
Amount done	<u>1,600,889 19</u>
	\$746,368 97
Add for engineering and contingencies.....	<u>53,631 03</u>
Total to complete, Binghamton to Pennsylvania line	<u><u>\$800,000 00</u></u>

As subsequent Legislatures failed to make appropriations for completing the work, final accounts were rendered and contracts were settled.

From year to year, as the work of construction progressed, estimates for the total cost were made, the amounts of which were gradually increased for various causes. The following table shows these estimates:

Year 1866, total estimated cost.....	\$1,545,802 00
Year 1867, total estimated cost.....	1,671,529 08
Year 1868, total estimated cost.....	1,780,565 75
Year 1869, total estimated cost.....	1,819,418 33
Year 1870, total estimated cost.....	2,215,319 08
Year 1871, total estimated cost.....	2,355,112 95
Year 1872, total estimated cost.....	<u><u>2,347,258 16</u></u>

By comparing the estimate of 1866 with those made by Mr. Allen in 1838 and by Mr. Childs in 1859, it will be found to be about twice the amount of those estimates. Construction work

was begun in 1865, just after the Civil war, when all prices were high and the supply of laborers scarce, and these conditions prevailed throughout the period of construction. The causes for these gradually increasing estimates may be found in the fact that during the progress of work many unexpected conditions were encountered. Rock, quicksand and porous soils were met; sliding banks necessitated riprap and heavier walls; an inadequate supply of stone was encountered; floods in the river demonstrated the need of heavier and higher embankments and increased sizes of aqueducts; the bettering of alignments made extra excavation. Contracts were generally relet at advanced prices and the numerous delays were expensive in causing resurveys to be made and in the general deterioration of work partly or wholly completed.

The abandoning of the enterprise was a great disappointment to the residents in that section of the state and the history of the canal proves the folly of the policy of delay which was adopted by the Legislatures. The need of direct water communication between the Pennsylvania coal fields and central, eastern and northern New York was very apparent when the subject began to be agitated, and doubtless the predicted benefits would have been largely realized if the work had been begun sooner and vigorously pushed to completion.

The whole project was agitated at most unfortunate times for its success. The first survey in 1838 came after the mania for lateral canals had partially subsided, and the people were fearful of undertaking another, especially as this was a time of financial straits, when the State had difficulty in continuing the work of enlargement on the Erie. The second agitation was just prior to the Civil war, and the work of construction was begun when the effects of this war were largely manifest in prices. Before the canal could be completed the decline of the lateral canals was evident and the Legislatures were slow to appropriate money.

Chapter 835, Laws of 1873, authorized the Binghamton, Dushore and Williamsport Railroad Company to lay a railroad track on the towing-path of that part of the Chenango canal extension lying south of the Susquehanna river, under the provision that the company should keep the embankments and mechanical

structures in good repair, should maintain and build farm and highway bridges and should pay taxes on the property as though it were the real owner. The act also provided that the railroad company should remove the tracks in the event of the completion of the canal. On October 1, 1873, the canal board gave its consent to the building of this proposed railroad upon the condition that the road should run to the bituminous coal fields of Pennsylvania and should connect with the Pennsylvania Central railroad. As the railroad company did not comply with the condition of the act, that the road should be commenced within two years, the property remained in charge of the State till the whole Chenango canal was abandoned and disposed of by public sale, by legislative grants, or by reverting to the original owners.

CHAPTER XIX.

THE GENESEE VALLEY CANAL.

Including the Dansville branch, the extension to Millgrove, and the various feeders and reservoirs, from the inception of the project to the abandonment of the canal.

The year 1825 marked a new era in the internal navigation of New York State. New York City now had direct water communication both with the Great Lakes and with Lake Champlain by means of the Erie and Champlain canals. The next step was by a system of branch or lateral canals, to connect the inland portions of the state with these main waterways.

The prosperity which had followed the opening of the Erie, section by section, and the rapidity with which the glowing predictions of early promoters were being realized led to a veritable canal mania. From all parts of the state came the cry for a share in the benefits of internal navigation, and the Legislatures were flooded with petitions which, if acceded to, would have covered the state with a network of canals.

In the western section of the state, in the valley of the Genesee river, was an extensive tract of wonderfully fertile and productive land, having no means of access to the markets of the country. The Genesee river, which meets the Erie canal at Rochester, is separated from the Allegheny river at Olean by a very narrow divide. By constructing a canal across this divide and by canalizing the two rivers, an unbroken inland water communication would be afforded between all the important sections of New York State and the valleys of the Ohio, Mississippi, Missouri, Arkansas, Osage, Illinois, Wabash, Tennessee and Cumberland rivers, three-quarters of the entire territory of the United States. The dream of so extensive a line of internal communication appealed to the people of the Genesee valley as affording irresistible arguments for constructing a canal along this route. As early as 1823 a petition from citizens of the counties of Monroe, Livingston,

Genesee, Allegany and Cattaraugus was presented to the State Legislature praying for an appropriation of \$10,000 from the State treasury for the purpose of improving the navigation of the Genesee river. This petition, however, had no immediate results.

This route was not considered to be of sufficient importance or else its advocates were not insistent enough to have it included in the first group of lateral canals that were authorized, but it was begun after the mania for canal-building had somewhat abated, after the utility of railroads began to be demonstrated, and its construction was protracted during a long period while the resources of the State were being severely taxed for the enlargement and repairs of the other canals. The whole history of this canal reveals a series of unfortunate events; the numerous delays were very costly; the time for building, most inauspicious; and even the advisability of beginning the project at so late a day is not sustained by results.

The subject first came before the Legislature for serious consideration as the result of a message of Governor De Witt Clinton in February, 1825, "respecting a navigable communication between the waters of the Allegany river and the Erie canal, and soliciting a full investigation of the proposed measure by able engineers"¹ and recommending the adoption of effectual preliminary measures.

As a result of this message, together with sixteen petitions from counties in the neighborhood of the proposed improvement, an act was passed on April 20, 1825, rendering it "the duty of the canal commissioners to cause examinations, surveys and estimates to be made of the most eligible routes . . . from Rochester to Allegany river at Olean, through the valley of Genesee river; from Scottsville, by way of Le Roy, to the upper falls of the Genesee river; . . . from Lake Erie to Allegany river, through the valley of the Conawanga, and from the Allegany river at Olean to the Erie canal by way of the village of Batavia."² In accordance with this law the canal commissioners in 1826 reported the practicability of each of these routes, although they did not endeavor to make any comparisons between them.

¹*Assembly Journal*, 1825, p. 612.

²*Laws of 1825*, p. 356. (Chapter 236.)

This act of 1825 showed to what an extent this desire to participate in the benefits of canal navigation had spread throughout the state. The act ordered the surveys of seventeen separate routes in various parts of the state. James Geddes, the veteran engineer of the Erie canal, made the surveys, and his reports were embodied in the communications from the canal commissioners. Although twenty-nine petitions were presented during the spring of 1826, no legislation was enacted concerning this project. In 1827 fifteen petitions were presented, some praying for the construction of a canal from the Erie canal by the way of Tonawanda creek to the Allegheny river at Olean; some by the Genesee valley route, and others for a canal from the Erie canal at Buffalo to the Allegheny river along the valley of the Conewango creek. The canal committee to which these petitions were referred could not select a line from the rough surveys already made of the three routes, and recommended that for the present the condition of the finances of the State was not such as to warrant the expense of constructing this canal.

In April, 1827, an act was passed incorporating a company to improve the navigation of the Cassedaga and Conewango creeks and the Chautauqua outlet. Although incorporated for the purpose of constructing the long desired canal, this company accomplished nothing.

During the next three years twenty-seven petitions were received.

In April, 1830, an act was finally passed authorizing a careful survey of the Genesee valley route, but as the appropriation (\$750) was so obviously inadequate, no survey was attempted.

From 1831 to 1833, only nineteen petitions were presented, but in 1834 the friends of the Genesee valley route began work in earnest and twenty-eight petitions were brought before the Legislature. The desire for the canal was no longer confined to the counties in the western part of the state, but from every section came petitions. Even the common council of the City of New York and the American Institute of the City of New York passed resolutions "appealing to the intelligence, justice and patriotism of the Legislature" to effect the necessary legislation for the opening of intercourse with Pittsburg and the inexhaustible beds of bituminous coal of western Pennsylvania by means of the canal

system of the State. The valley through which this proposed canal was to pass contained over one hundred thousand inhabitants and remarkably fertile lands. Annually over 200,000,000 feet of lumber passed down the Allegheny river, and it was supposed that this would, for the most part, be deflected to the New York State canals. From these considerations the canal committee recommended a minute survey of the Genesee valley route. An act to this effect was passed on April 30, 1834, and it also provided for a side-cut from the village of Dansville down the Canaseraga creek to the Genesee valley line at or near Mount Morris.

In compliance with instructions received from the canal commissioners a very complete survey and examination of the proposed route was made by an engineer, Mr. Frederick C. Mills, the result of whose investigations was embodied in the report of the canal commissioners on March 2, 1835. Mr. Mills reported that the proposed canal, side-cut and navigable feeders, if located on the west side of the Genesee river, would extend over $122\frac{1}{4}$ miles, with 1,057 feet of lockage and were estimated to cost \$1,890,614.12; if the east side of the river were chosen, the length would be $123\frac{3}{10}$ miles, the amount of lockage the same, and the estimated cost, \$2,002,285.92. These estimates did not take into consideration damages to lands through which the canal was to pass or to hydraulic works and water-privileges. A part of the line south of Mount Morris was shown to be very difficult and expensive. At the falls, the high lands closed in upon the river with perpendicular sides, at some places rising nearly four hundred feet. In a distance of two miles the river appeared to be a continuous succession of falls, descending two hundred and seventy-four feet. The plan proposed was to construct a tunnel for one thousand and fifty-six feet through an immense projecting cliff of rock. The summit level of this canal was to be eleven and a half miles long and the greatest depth of excavation was stated at twelve feet. It was estimated that an adequate supply of water could be obtained without any material damage to water-privileges.

This report was made too late in the year for any action to be taken on it, but the friends of the project were determined that by persevering they would win, and during the sessions of 1835-6 one hundred and eleven petitions were filed. Finally, on the 6th

of May, 1836, an act was passed (chapter 257), providing for the construction of a navigable canal, to be known as the Genesee Valley canal, "from the Erie canal in the city of Rochester, through the valley of the Genesee river, to a point at or near Mount-Morris; and from thence, by the most eligible route, to the Allegany river, at or near Olean; and also a branch of the same, commencing at or near Mount-Morris, and extending up the valley of the Canaseraga creek, at or near the village of Dansville. And should the canal commissioners be of the opinion that the construction of the said canal will injure the hydraulic privileges at Rochester, then they are required to connect the said canal with the Genesee river, above the feeder dam above Rochester, and from thence to construct a navigable canal to the Erie canal, or improve the Erie canal feeder from this place, as *may* best promote the public interest.

"The canal commissioners shall determine on the width and depth of the said canal and branch . . . and shall borrow, on the credit of the state, . . . such sum or sums of money as shall be required for the same, as they shall deem best for the interest of the state, not exceeding two millions of dollars."

In June, 1837, contracts were let for building that portion of the canal extending from the Erie canal in Rochester to the rapids on the Genesee river, a distance of two miles. The estimated cost of these two miles of canal, including the expense of a dam across the Genesee river, was \$47,492.59. On the fourteenth of November, 1837, proposals were received for constructing twenty-eight miles of this canal from the rapids to Piffard's in the county of Livingston. The cost of the work calculated at contract prices was \$522,181.89, while the estimate of 1834 was only \$408,725.63, but the prices of supplies of all kinds were considerably higher than when the first estimate was made.

At Scottsville the Genesee Valley canal crossed that of the Scottsville Canal Company, a company that was organized in 1829, with a capital of \$15,000 to build a canal from Scottsville to the Genesee river.

By January 1, 1839, the first two miles of the Genesee Valley canal were completed and work was in progress on fifty-one miles more, from the rapids to Dansville, all of this work to be com-

¹*Laws of 1836*, p. 340.

pleted, according to the terms of contracts, by October 1, 1840. In addition, the canal commissioners had made a careful examination of the various proposed routes from Mount Morris to the Allegheny river, and after having finally decided on a route, contracts for fifty miles had been let on October 31, 1838. This route passed from Mount Morris up the valley of the Canaseraga creek to the Keshequa creek, following the line on which the branch canal to Dansville had been located; thence up the valley of that stream through the village of Nunda and Messenger's hollow, by the deep cut near Colonel William's, and thence to the Genesee river, crossing that stream by an aqueduct to Portageville; thence up the west side of the river to Black creek; thence up the valley of that stream to Cuba; thence down on the east side of Oil creek to Hinsdale; thence down on the east side of Olean creek to near the village of Olean, crossing that creek by an aqueduct, and thence passing the village of Olean to the Allegheny river. The work under contract at that time between Rochester and the village of Nunda called for an expenditure of \$1,959,011, while the estimated cost of completing the canal between Nunda and the Allegheny river amounted to an additional sum of \$2,791,111.79. These contracts and plans called for a canal twenty-six feet wide on the bottom, forty-two feet wide at water-surface, the banks seven feet high and calculated for four feet of water, the locks to be built of hammer-dressed masonry, laid in hydraulic cement, ninety feet long and fifteen feet wide.

In May, 1839, an act (chapter 305) was passed favoring a cheaper form of lock and giving the canal commissioners the power to change the plans accordingly, thereby reducing the expense of the canal \$384,506.95. The contracts for the remaining twenty miles were let in October, 1839.

That portion of the Genesee Valley canal between its intersection with the Erie canal at Rochester and the Genesee river dam near Mount Morris, a distance of thirty-six miles, was so far completed that water was admitted in the latter part of August and navigation was opened on the first day of September, 1840. On that day the first packet boat passed up the canal from Rochester to Mount Morris and a daily line of packets then began this trip. Numerous warehouses were erected along the line of the canal and freight boats were engaged in the transportation of

produce and merchandise. A collector's office was established at Scottsville and from then until the close of the season \$6,929.15 was collected in tolls.

In the fall of 1841 the canal was opened from Mount Morris to the junction at Shaker settlement, 5.22 miles, and the branch from thence to Dansville, 11.12 miles, thereby giving fifty-two miles of finished canal. In April, 1842, a collector's office was established at Dansville and a collector appointed. The portion of the canal, from Dansville to the Genesee river, which was completed, was supplied with water from the Canaseraga and Mill creeks.

In April, 1840, an additional appropriation of \$500,000 had been granted to carry on the work of the Genesee Valley canal, and by an act (chapter 194) passed May 18, 1841, the canal commissioners were authorized to borrow, on the credit of the State, \$550,000 to be applied toward the construction of the canal.

The financial panic of 1837 had so disturbed monetary affairs that the work of enlarging the Erie, building the Black River and Genesee Valley canals, and repairing the other canals was prosecuted under considerable embarrassment till the passage of what is popularly known as the "Stop law." On March 29, 1842, this act (chapter 114) was passed for the professed purpose of "paying the debt and preserving the credit of the State." It ordered the suspension of all expenditures on public works at that time in progress of construction, except such as were necessary for the protection of work already done. This act practically stopped all work on the canals of the state, and contracts already let were stopped abruptly.

From this time till the new Constitution allowed further appropriations there is little of interest to record. In March, 1843, it was estimated that the total cost of the Genesee Valley canal would be \$4,535,776.47 and work to the amount of \$4,224,700.88 was then under contract. During the summer of 1843 practically no work was done on the canal beyond that absolutely essential in the line of repairs. During this season navigation was more or less interrupted on the Dansville branch from the inadequacy of the water-supply. Another obstruction to navigation during the early part of the season was experienced in consequence of large

accumulations of deposits above the dam across the Genesee river near Mount Morris. It was originally intended to cross the river at this point by means of an aqueduct, and the contract was let and well under way, when in 1839, under an act respecting the Genesee Valley canal, passed May 1, 1839, the aqueduct was dispensed with by the acting commissioner then in charge, who was of the impression that he was thereby cutting down expenses, and a plan of locking boats to the pool above an existing dam was adopted. The aqueduct would have been very expensive, but a channel had to be dredged above the dam to allow boats to cross the pool, and nearly four thousand cubic yards of accumulated earth had to be taken out annually. If all the difficulties of maintaining good navigation through the pond could have been foreseen, it is probable that the original plan would have been carried out and the aqueduct constructed.

The citizens of Dansville were dissatisfied with the terminal facilities that had been supplied for them, and after having applied in vain to the canal board and the canal commissioners for the construction of a slip or for permission to construct a slip from the village of Dansville and connect it with the side-cut, they proceeded to construct a slip and basin and applied to the Legislature in 1844 for permission to connect them with the side-cut. Several remonstrances were also presented to the Legislature against building or assuming this work as a State charge.

After a bill for this purpose had been defeated the people of Dansville were greatly aroused and one evening at dusk more than a hundred of them assembled on the bank of the canal. One of their number who was a large property owner mounted a pile of lumber and made an incendiary speech to the people, describing the manner in which the bill was defeated; he said to the crowd that they "were the sovereign people, and their rights had been trampled on, and they must do as their forefathers did to resist oppression, obtain their rights (as he called them) by their own power."⁴ On the following morning they reassembled and cut through the berme bank and let the water into the new side-cut, after using force to eject the State employees from the village. Indictments were secured against the ringleaders of this mob and they were all punished.

⁴*Senate Documents*, 1845, No. 96.

At the next session of the Legislature another bill authorizing the builders of the side-cut to connect with the Dansville branch of the Genesee Valley canal was defeated on the ground that its passage would sanction a violation of law.

Not until 1848 (chapter 172) was the canal board authorized to assume the Dansville slip and basin as a part of the Dansville branch of the Genesee Valley canal. The main objection to this slip was the fact that even without it the supply of water was inadequate and it would require a great deal of water from the side-cut and could give none in return. In accordance with this act the canal board assumed the slip and basin on December 10, 1851, and they were thereafter considered a part of the canal.

Some repairs were made to the canal in 1844-5. The banks were, to a considerable extent, composed of material easily affected by the action of water and required much labor to keep them in repair.

By an act of May 12, 1846 (chapter 246), the commissioners of the canal fund were authorized to pay to the canal commissioners \$10,000 to be expended by them in protecting and preserving from decay the unfinished works and in the preservation of materials collected for construction. A large amount of this fund was spent for transporting materials from the unfinished to the finished portion of the canal near the Shaker settlement, to be used in repairs or to be otherwise disposed of. Although operations had been stopped, for the most part, for over four years the work was standing well. The unfinished portion extended from the junction at Shaker settlement to Olean, a distance of sixty-six and a half miles, in which there were ninety-five lift-locks, the foundations of seventy-one of which had been laid.

On January 1, 1847, the new State Constitution went into effect; this permitted appropriations for the canals under article 7, section 3, which reads as follows: "After paying the said expenses of superintendence and repairs of the canals, and the sums appropriated by the first and second sections of this Article, there shall be paid out of the surplus revenues of the canals, to the Treasury of the State, on or before the thirtieth day of September in each year, for the use and benefit of the General Fund, such sum, not exceeding two hundred thousand dollars, as may be required to defray the necessary expenses of the State, and

the remainder of the revenues of the said canals, shall, in each fiscal year, be applied in such manner as the Legislature shall direct to the completion of the Erie Canal enlargement and the Genesee Valley and Black River canals, until the said canals shall be completed."

From the time of resuming work till the opening of the entire canal in 1862 the record shows a continuous succession of small appropriations. The first of these was made by the act of May 12, 1847, (chapter 263) by which \$128,000 was appropriated towards the construction of the Genesee Valley canal. In pursuance of this act contracts were let for finishing section No. 54, known as the "Deep Cut;" for finishing the Portage tunnel, ten hundred and eighty-two feet in length, and some smaller pieces of work. By an act of 1847 (chapter 446) a further appropriation of \$50,000 was made and this enabled the commissioners to let the contract for the completion of the foundations and masonry of the Portage aqueduct and several locks.

About this time it was found that the Genesee Valley and Erie canals were taking so much water from the Genesee river as to greatly damage the water-privileges of the many manufacturing interests located on the river, in and below Rochester. The Legislature took action immediately, and after several methods of augmenting the supply of water in the river were examined, they decided that making a reservoir of Conesus lake was the most feasible plan, and by an act of April 12, 1848, (chapter 339) they authorized the canal commissioners to construct the works necessary for this purpose.

The Legislature appropriated the sum of \$218,000 on April 10, 1848, (chapter 217) to be applied to the construction of the canal, between the navigable canal at Mount Morris and the Genesee feeder at or near Caneadea. The contract for the completion of the Portage tunnel was abandoned by the contractors with the consent of the commissioner in charge, in September, 1848, and a new contract for an "open cut" in place of the tunnel was awarded, thereby directly saving over \$72,000 to the State, and indirectly a large amount, as a tunnel would require very large expenditures to keep it in repair.

In 1849 that section of the canal from Mount Morris to the Caneadea feeder, thirty-six and one-half miles, was all in progress

of construction. This entire distance was to be supplied with water from the Genesee river at Caneadea and from the Wiscoy creek. On the remaining portion from Caneadea to Olean (thirty-two miles), a large amount of work was done previous to the suspension of work in 1842. From previous experience with stone found in this vicinity, it was found that it would not withstand the action of the atmosphere and frosts, therefore the canal commissioners changed the plans, specifying wood instead of masonry locks, thereby reducing the cost \$38,500.

On April 5, 1849, (chapter 227) the \$128,000 appropriated in 1847 (chapter 263), or as much as remained unexpended, was reappropriated and in addition \$120,000 was appropriated (chapter 229), to be applied between the navigable canal at Mount Morris and the Genesee feeder at or near Caneadea, and \$20,000 to the Ischua reservoir. In the following year an appropriation of \$170,000 was made (chapter 192), to be expended on the construction of the canal.

In the spring of 1851 thirty-six miles of canal extending from the Shaker settlement, four miles above Mount Morris to the Genesee river feeder, near the village of Rousesville, were opened. This made eighty-eight miles of completed canal and left thirty miles partially finished. Work on this last section was going on rapidly. The Rockville reservoir and the Ischua feeder were commenced in 1839 and 1840. Millions of feet of lumber and staves, besides timber, shingles and other produce were transported over the new portion of the canal during the season of 1851.

Most of the supply of water required for the canal between Oramel and Olean was to be furnished from Oil and Ischua creek feeders and reservoirs, the estimated cost of which was \$133,400. These were the most important and expensive works yet to be constructed and it was necessary that they should be started soon, as their completion was essential to the opening of the last thirty miles of the canal.

In 1853 (chapter 620), \$100,000 was appropriated towards the completion of the Genesee Valley canal. In the following year (chapter 329) an additional sum of \$65,000 was allotted to this canal.

In 1854 (chapter 331), in response to petitions for a navigable feeder for the Genesee Valley canal from the Genesee river at Wellsville to intersect the canal at or near Belfast, the Legislature instructed the canal board to prepare maps, plans and estimates for this feeder. In March, 1855, the canal board reported unfavorably on this project.

In the spring of 1856 an act was passed (chapter 149), directing "the state engineer and surveyor and canal commissioners . . . to cause surveys to be made for extending the Genesee Valley canal, from or near the first lock north-east of the village of Olean, across and through the bottom lands lying between said lock and the Alleghany river, to the pond in said river known as the Millgrove pond, and to make the necessary plans and estimates of the cost of the construction of said canal, by the route and to the point aforesaid."⁵

At this session of the Legislature only \$32,000 was appropriated for the Genesee Valley canal (chapter 148). At the next session, April, 1857, an act was passed (chapter 247), authorizing the extension of the canal as contemplated by the act of 1856 (chapter 149), provided the total cost could be kept under \$109,000.

By chapter 365 there was appropriated \$63,142.36 towards the completion and extension of this canal, and in the next year (1858) \$40,000 was apportioned for the canal proper, and \$61,212.36 for the extension.

In the spring of 1856 all work on the main canal was under contract and rapidly nearing completion and the contract for the Oil creek reservoir, which was to supply the deficiency of water experienced during the dry part of the season, had at last been let, and was in a fair state of progress. Two miles of canal from Oramel to Belfast had been opened in 1853, and in 1854 three miles more, extending from Belfast to Rockville, were completed and brought into use, making ninety-three miles of completed canal. That section from Rockville to Olean (twenty-four miles) was completed in the season of 1857, thus making one hundred and seventeen miles of completed canal. During the first season the only sources of water-supply for that portion of the canal

⁵*Laws of 1856*, p. 243.

south of Rockville were the natural flow of Black, Oil, Chamberlain and Ischua creeks, as the Oil creek reservoir was not completed until 1858. In consequence of the leaky condition of the banks and the scarcity of water, the canal below Hinsdale could not be filled and it was found necessary to construct a feeder five rods in length from Olean creek to the canal.

In November, 1857, the work for the construction of the extension of the Genesee Valley canal from Olean nearly seven miles up the valley of the Allegheny river to Millgrove pond was put under contract. About six miles of this canal was completed and brought into use in August, 1859. The rest of this work was so situated that it could not be done advantageously except in time of low water. This extension of 6.70 miles would, when completed, connect the Genesee Valley canal with the Allegheny river; and by a navigation of twelve miles on that river, and a projected railroad of about twenty miles, it would connect with coal mines said to be of great value and of almost inexhaustible supply, and also with very extensive timber tracts. Although one of the objects of constructing the Genesee Valley canal was to connect with the Allegheny river at Olean, that object was not then accomplished. To connect with the river at this point would involve the construction of two locks, originally estimated to cost \$23,220. At this time it was thought that the construction of these locks might be desirable but that their completion was not then demanded. Neither the State of Pennsylvania nor the United States Government had carried out their alleged plans of improving the Allegheny river, so that the original scheme of drawing trade from the Ohio and the other great rivers, to which its waters afforded access, was destroyed. Pennsylvania did not wish to further New York's interests in this way, for she now had means of transporting goods from Pittsburg to the coast without permitting any other State to reap the advantages of their transportation.

The Buffalo, Bradford and Pittsburg railroad was then being exploited. This railroad was to cross the Allegheny river about fifteen miles below Olean, and it was claimed that its construction would bring for transshipment to the river and thence to the canal, coal and lumber in sufficient quantities to warrant the ex-

penditure necessary for the construction of the locks and the improvement of the river.

In 1859 (chapter 149) \$17,700 was appropriated for the completion of the canal and extension. This was followed in 1860 (chapter 213) and 1862 (chapter 137) by appropriations of \$56,840 and \$8,000, respectively.

In December, 1861, the extension of the Genesee Valley canal was completed and brought into use on the opening of navigation in 1862. This completed the construction of the canal and the accounts were closed. The lockage from Rochester to the summit level in Allegany county was all ascending, as was also that by the branch to Dansville in Livingston county. The summit extended from New Hudson to North Hinsdale, a distance of about twelve miles, thence the canal descended to the Allegheny river.

The provisions made for supplying the canal with water were as follows: proceeding southerly from the Erie canal, there were: first, a feeder from Allen's creek at Scottsville; second, the Genesee river, one mile north of Mount Morris; third, a feeder from Wiscoy creek at Mixville Landing; fourth, a feeder from the Genesee river at Oramel; fifth, Rockville reservoir at Rockville; sixth, a feeder from Oil creek reservoir, two miles north of Cuba; seventh and eighth, Champlain and Chamberlain's creeks, in the village of Cuba; and ninth, a feeder from Ischua creek near Hinsdale. The last four feeders entered the canal on the summit level. South of the summit at Smith Mills there was a short feeder from Olean creek. The Dansville branch was supplied by a feeder from Mill creek at Dansville and one from the Canaseraga, two miles north of that place. The supply for the branch was not quite sufficient during the dry season, but that of the main line was ample for the needs of that time if properly husbanded. Of all these feeders and reservoirs the Oil creek reservoir was by far the most important. Its flow line, when full, covered about four hundred and seventy acres and its average depth was estimated at twenty-five feet. At the dam it was forty-six feet in depth. The embankment forming the dam was two thousand feet in length, fifty-six feet in height and

two hundred and ninety feet in breadth at the base where it crossed the channel of the creek.

The locks of the canal were of three kinds: wooden, composite and stone. The wooden locks were used on account of the poor quality of the stone of that region and the great expense of bringing stone there before the canal was opened. It was intended to rebuild these with stone as soon as the canal could be used as the means of transporting the material.

In April, 1863, an act was passed (chapter 342) authorizing the canal commissioners to raise the water in Oil creek reservoir three feet, also to build a dam across Ischua creek at Ischua feeder at such elevation as might be determined by the canal board and to raise and maintain, at an elevation of five feet above the bottom of the canal, the dams across the streams that supplied with water that part of the canal designated as the extension of the Genesee Valley canal.

It was difficult to meet the ever increasing demand for more reservoirs, caused by the growing business of the canal, and in 1864 (chapter 170) the Legislature appropriated \$85,000 towards making a reservoir of Lime lake and towards rebuilding with rubble masonry five locks. In 1866 (chapter 304) the balance of the 1864 allowance was reappropriated and the further sum of \$6,936.26 was added to it for the original purpose of the act of 1864. The locks were completed and brought into use during the following season.

Owing to the nature of the country, either with its many streams flowing into the canal or with the canal following their winding courses through the narrow valleys, the Genesee Valley canal was bound to require large expenditures for maintenance and repair. It was a country of floods; the outlets of the valleys could not take care of their great drainage areas and the floods frequently washed out canal embankments and carried away dams, locks and aqueducts.

On May 7, 1868, an act was passed (chapter 715) appropriating the sum of \$242,000 for furnishing additional water to the summit level of the Genesee Valley canal, improving Ischua feeder, changing the plan of rebuilding Ischua feeder aqueduct, removing Mud lock, deepening and widening the channel of

the Genesee Valley canal, from the guard-lock at the rapids to the junction with the Erie canal, for protecting the canal at the "slide banks" and for improving the canal in general.

After careful investigation it was decided that the best way of increasing the supply of water for the summit level was to raise the surface of Oil creek reservoir six feet (covering an area of about five hundred and twenty-five acres) and to construct a new reservoir on the Ischua creek by raising a dam about twenty-five feet in height, and thus flooding some two hundred acres. It was estimated that these improvements would furnish a supply of water sufficient for the lockage of twenty-seven boats per day in each direction through the entire season and that this would meet all demands for many years to come. But in 1869 the canal commissioners decided that, as the proposed reservoir of Ischua creek would flood the best farming lands of that section, it would be cheaper to raise the State dam across the Ischua creek about six and one-half feet and to increase the capacity of Oil creek reservoir by raising the dam there an additional two feet.

On May 12, 1869 (chapter 877), the Legislature set aside \$50,000 for protecting the slide banks and otherwise improving the Genesee Valley canal. In the following year (chapter 767) \$100,000 was allotted to the Genesee Valley canal for improvements and for completing work already under contract. In 1871 the Legislature (chapter 930) appropriated \$13,000 for constructing a stone abutment and docking at the east end of the dam across the Genesee river at Mount Morris and \$12,000 to pay for work at that time under contract and for protecting the Genesee Valley canal against the encroachments of the Genesee river.

On May 23, 1872 (chapter 850), the Legislature made provision for increasing the water-supply at the Dansville end of the Dansville side-cut. An appropriation of \$10,000 was made for conveying the water from Loon lake into the canal at Dansville by discharging it through Mill creek. Loon lake was about ten miles from Dansville; it was about one mile long and one-third of a mile wide, and by opening a channel about one-quarter mile in length the water would pass down natural watercourses

to Mill creek above the point where that stream entered the side-cut. The contracts for deepening the summit level and for raising the dam of Oil creek reservoir were completed during the season of 1872. In 1873 the Legislature appropriated \$18,537.94 for the canal (chapter 643) and in the following year (chapter 399) \$2,000 was set apart for raising the tow-path bank on the four and six-mile levels to prevent flood waters of the Genesee river from overflowing.

There was considerable delay in the opening of navigation in the spring of 1874, occasioned by an extraordinarily high freshet. At first it was supposed that the damage which the canal had sustained was so great that the State would not be warranted in attempting to put it in repair. The dam was carried out at Shaker's, together with much embankment both there and along the Cuba level. It was finally decided to make temporary repairs and navigation was opened about the first of June.

Shortly before this time the public mind began to be agitated on the subject of abandoning some of the lateral canals, but as another chapter has been devoted to a study of the causes that led to this condition it is not needful here to repeat the deductions from that study, but simply to state a few of the facts as they related to the Genesee Valley canal.

At the fall election of 1874 the State Constitution (article 7, section 6) was so amended as to "give the Legislature the authority to sell, lease or otherwise dispose of" any of the canals of the State, except the Eric, Champlain, Oswego and the Cayuga and Seneca canals. As it could not have been supposed possible to "sell or lease" the other lateral canals which were not paying financially, on conditions which required the purchaser to maintain and operate them, this amounted to abandonment, should the Legislature decide to dispose of them.

By an act of 1875 (chapter 499) the Legislature required the canal board to investigate and report upon the disposition to be made of the lateral canals; to take testimony and examine maps, surveys and documents relating to the same; to ascertain whether they should be sold, leased or abandoned; whether any should be retained as feeders and as to what effect such sale,

lease or abandonment would have upon the legal rights of individuals.

According to the report of the canal board the Genesee Valley canal had cost in the aggregate \$6,723,625.23, with some claims against the State on file in the appraisers' office. They recommended that the State should lease the canal for a term of years or should sell it outright on condition that it should be maintained in good condition for four or five months each year. If it were impossible to either sell or lease the canal, they advised that the State should abandon the canal at the end of three or five years.

In May, 1876, a commission of three citizens of the State,—Warner Miller of Herkimer county, E. W. Chamberlain of Allegany county and Artemus B. Waldo of Essex county,—was appointed by the Legislature (chapter 382) to further investigate the advisability of abandoning the lateral canals. An appropriation of \$40,000 was made at the same time (chapter 386) to defray the expenses of collecting tolls, superintendence and maintenance for the year.

These commissioners reported that many of the structures on this canal were in a condition to last for two or three years with slight repairs, but some of them would need extensive repairing to fit them for another season's service; that the amount of tolls collected during the season of 1876 was \$14,668.50, the amount of tolls contributed to the Erie canal was only \$513 and the expenditures for repairs and employees amounted to \$23,264.10; that the expenses for operating the canal during a season of three or four months in 1877, if no unusual break occurred, need not exceed those of 1876; that the reservoirs and feeders along the line of the canal were not required to supply the Erie; that ample facilities for transportation were furnished by the adjoining railroads and that these roads had already superseded the canal in the carrying of nearly all the trade and tonnage of the country, except in the article of lumber. Therefore, they advised that it should be opened for at least a part of the season of 1877, that the lumber products stored along the route might be shipped, and that then the canal should be abandoned. They recommended that the Dansville branch should be closed immediately (January 19, 1877).

By an act of June 4, 1877 (chapter 404), the Legislature directed that the Genesee Valley canal should be abandoned and discontinued as a canal and be no longer subject to the control or authority of any of the canal boards or officers of the State on or after the thirtieth day of September, 1878. The act also directed that it should be the duty of the canal commissioners or Superintendent of Public Works, subject to the approval of the canal board, as soon as practicable after the close of navigation in the year 1878, to advertise for sale and to sell the Genesee Valley canal, its feeders, branches, appurtenances and water-privileges. On June 18, 1879 (chapter 522), this act was amended and the date for selling the canal was changed to January 1, 1880.

In 1880 the division engineer of the western division reported the need of retaining the Cuba and other reservoirs of the abandoned Genesee Valley canal as feeders for the Erie canal. Under chapter 326, Laws of 1880, the Legislature authorized the commissioners of the land office to sell the banks and prism of the Genesee Valley canal for \$100 per mile to any railroad corporation that would give bonds as a guarantee that it would, within two years, begin the construction of a standard gauge railroad substantially following the line of the Genesee Valley canal. This act reserved two sections of the canal property—from Allen's creek feeder to Rochester and from Cuba reservoir to Rockville reservoir.

On November 6, 1880, the Governor deeded the main line of the Genesee Valley canal to the Genesee Valley Canal Railway Company, so that, with the exception of the Cuba reservoir, its feeder of about three-fourths of a mile between the reservoir and the Genesee Valley canal, about seven and a half miles of canal below the mouth of the feeder and about ten miles between the dam across Allen's creek and the City of Rochester, the Genesee Valley canal was no longer under the control of the State. These portions were retained for the purpose of feeding the eastern end of the "long level" of the Erie canal in the City of Rochester.

By an act of 1882 (chapter 166) the State sold the Dansville side-cut and the Wiscoy and Ischua reservoirs and feeders to

farmers whose lands abutted on these sections of the canal and feeders.

This canal with its numerous structures, costly in their original construction and not less so in their maintenance, was built after the era of canal-building had substantially ended. The locomotive, and consequently the method of transportation by railway, had just come into use and was practically tested when the construction of the Genesee Valley canal was entered upon. The Erie railroad was completed and in operation when the last section of the canal was brought into use at Olean.

The expectations of the projectors of this canal, as they related to its business and its pecuniary importance to the country, were never realized. The Genesee Valley canal, like the other laterals, probably did not, in the way of tolls received, pay more than one-quarter the cost of repairs, but it saved over \$150,000 annually to the people of the City of Rochester in the reduced price of lumber. The measure of its utility was out of all proportion to its cost, but there is reason to wonder whether the agricultural wealth it created, the industries it stimulated, encouraged and established, the thousands of benefits and conveniences which it yearly conferred, directly and indirectly, on the country through which it passed and at its termini, were not so vast in the aggregate as to counterbalance to a large extent the expenditures that the State had made.

CHAPTER XX.

THE DELAWARE AND HUDSON CANAL.

The discovery of the anthracite coal fields of eastern Pennsylvania; the opening of eastern markets to this coal by the building of a canal through private enterprise, under charters from New York and Pennsylvania; the growth of this company into a great railroad corporation, and the final abandonment of its canal.

No history of the canals of New York State would be complete without including that of the Delaware and Hudson canal. Though it was no part of the State-owned system of artificial waterways, the story of its inception, its construction, its progress and its final elimination is inseparably interwoven with the history of the State—with its commercial development, its resources and its civilization.

During the earlier years of the last century, the southern portion of the state, lying between the route of the Erie canal and the Pennsylvania boundary, was still a comparative wilderness. Between these limits was a vast territory of forested mountains and valley, almost untouched by the advancing tide of emigration which had begun to sweep by, through the Mohawk valley, to the west.

Not indeed until 1814 did the census of the state show a population beyond the million mark, and from sixty to seventy per cent of this number were practically concentrated along the borders of the Hudson, the Mohawk and the other great waterways of the state.

Lumbering was the principal occupation of the people of this district, the products being rafted down the Delaware and Susquehanna to market. The surplus earnings of the inhabitants were mostly absorbed in clearing the forests, draining the land and in the erection of houses, mills and other improvements required by the settlers of a new country. Turnpikes, or toll roads, were constructed between principal points and the stage coach was the only available means of communication by public

conveyance. As far as possible the inhabitants were accustomed to use, for transportation facilities, the waterways upon which they had settled, as steam railways were not yet in existence.

As problems of markets and of commerce began to engage their attention, it was but natural that in seeking to better the means of transportation they should turn first to the improvement of the natural channels of the streams, and later to the construction of other and artificial waterways. So came the period of canals—a form of transportation soon to attain a great ascendancy. The construction of the Erie canal a few years later, the discussion of which was even then becoming prominent in State affairs, gave a powerful impetus to many schemes of canal communication. Scores of projects of this character were, within a brief period, authorized by statutory enactment, but most of them never passed beyond this stage. Financial difficulties precluded their construction. A few were partially or wholly completed, only to be absorbed later, by purchase or agreement, into the great system of State canals which solved for a time, the question of interior transportation.

The history of the Delaware and Hudson Canal Company, reaching back, as it does, for nearly a century from the present time, and embracing the period of greatest commercial development of the State of New York, is unique in one respect. With the one exception of the shorter and comparatively less important Junction canal elsewhere described, it is the only enterprise of its kind within the state that remained in the hands of its original projectors in spite of financial difficulties, doubts of its ultimate success and the active opposition of competitors, developing in later years into a great transportation and mining corporation which is to-day a power to be considered among similar interests. And yet this same company, in the early days of its precarious existence, was twice compelled to seek the powerful aid and financial backing of the State's credit, without which it may well be doubted whether it would have survived to attain its present success.

The initiative of this enterprise, we are told, was largely due to the powers of observation, the foresight, energy and persistence of William Wurts, who, with his brothers Charles and

Maurice, were business men of Philadelphia. Without being a professional geologist, or even a hunter or trapper, he was fond of taking long tramps and excursions through the valleys and along the streams of northeastern Pennsylvania, sleeping in the forest wherever overtaken by night, and subsisting on provisions from the knapsack of a chance hunter or upon the trout which he lured from the cool streams of the Lackawaxen and Lackawanna. As far back as 1812, while on one of these periods of wandering, he was attracted by the black stones which he noticed cropping out of the ground here and there. He became interested and, believing they had value, week by week and month after month, he followed and examined these outcroppings, noting their location, until he had practically traced the outlines of the great northern and eastern anthracite coal fields of Pennsylvania.

On his return he carried specimens to Philadelphia. Submitting them to his brothers, he finally induced them to go back with him and look over the ground. Convinced by repeated trials of its value as fuel, they began the tedious struggle to convince others, and to establish it as a marketable commodity. They labored under adverse circumstances, often defeated, but never giving up. Their frail rafts upon which they attempted to embark a few tons of coal were driven by the currents against projecting rocks and sunk and, when, with a few tons, they finally reached Philadelphia, their hard-won cargo was condemned as being of little or no value. But lands were then also of little value in this almost inaccessible wilderness where the deposits of coal were found. Extensive purchases of lands, whose value afterwards rose to hundreds and thousands, were made by the brothers at prices averaging from fifty cents to three dollars per acre.

The almost incalculable value of this discovery may be shown by reference to Colange (1900), who limits the anthracite area of Pennsylvania to about five hundred square miles, embraced in three great regions: the Schuylkill, or southern; the Lehigh, or middle; and the northern, covering the Lackawanna, Scranton and Wilkesbarre regions. The production is now very largely controlled by great mining and carrying corporations. From the commencement of the industry in 1820, with the shipment of three hundred and sixty-five tons, it is estimated that more than ~~an~~

many million tons have been marketed. With the area of this variety of coal in the United States so limited, and the absorption of territory so rapid and wasteful, it is thought that within a very few years anthracite coal will become a luxury and command its price as such.

After more than ten years of adverse fortune and embarrassments, the day of success began to dawn upon the efforts of the Wurts brothers. While the collieries of the Lehigh and Schuylkill could readily supply, with the coal which those regions furnished, the markets at Philadelphia and the south, the Lackawanna coal-fields reached out east of the Susquehanna to within a hundred miles of the Hudson, and methods of reaching an eastern market were sought.

The General Assembly of Pennsylvania, at the session of 1822-3, passed an act "To Improve the Navigation of the Lackawaxen River," which was in effect a charter to empower Maurice Wurts to clear out and improve the channel, to establish dams, locks or canals, to make good descending navigation at least once a week, or to complete a system of slack-water navigation at his discretion and to establish tolls, with various limitations and restrictions, for a period of thirty years, with a clause providing for resumption by the State thereafter, this latter clause being repealed in 1852. This was closely followed by the passage of the original act of incorporation of "The President, Managers and Company of the Delaware and Hudson Canal Company," by the Legislature of New York State on April 23, 1823, (chapter 238) under which the company claimed its full corporate powers and existence. The preamble recited the desirability of introducing "stone" coal to New York State, the existence of extensive beds of this coal owned by Maurice Wurts, the Pennsylvania act authorizing the improvement of the Lackawaxen and the petition of certain citizens of New York for water communication between the Hudson and the Delaware rivers.

The charter authorized eleven commissioners, namely: G. B. Vroom, Philip Hone, Lynde Catlin, Jonathan Thompson, Garret B. Abeel, George Janeway and Elisha Tibbits of New York, George D. Wickham and Hector Craig of Orange county, Abram Hasbrouck and John C. Broadhead of Ulster county to receive subscriptions to the capital stock of the enterprise, in shares of one

hundred dollars each. Upon the subscription of two thousand shares, the commissioners were to become a "body politic and corporate" under the name of "The President, Managers and Company of the Delaware and Hudson Canal Company," capable of perpetual succession, with full powers of management, subject only to the laws of the State. They were authorized to construct a canal of suitable dimensions, with all necessary appurtenances, including river feeders, from a point on the Delaware river, through Orange, Sullivan and Ulster counties, to a point on the Hudson river, to maintain the canal and collect tolls, not to exceed eight cents per ton-mile for coal and half that rate for other merchandise. Broad powers of increase in capital stock, at the discretion of the managers, appear to have been likewise given them. They were further empowered to purchase from Maurice Wurts his rights under the Pennsylvania act, to improve the navigation of the Lackawaxen river and to purchase his or other coal lands lying adjacent.

In the spring of 1823, Maurice and William Wurts secured the services of Judge Benjamin Wright, chief engineer of the Erie canal, and in May of that year instructed him "to have a proper survey or running level carried over the country from tide-water of the Hudson river, at the mouth of the Walkill, up the valley of the Rondout, and thence over to the Delaware river, and thence up the same to the confluence of the Lackawaxen, and thence up the Lackawaxen to a point as near to the coal mines as possible," also to ascertain the practicability and expense of a canal over that route. Other engagements interfering with his plan to personally conduct the survey, in June, Judge Wright directed Mr. John B. Mills, a young engineer of promise, who had been one of his assistants on the Erie canal, to make the reconnaissance. Mr. Mills completed his work in September. The exact line was not located, but approximate estimates were made, which included the cost of nine dams that were located on the Delaware river, below the mouth of the Lackawaxen.

In order, as he says, to obtain all possible knowledge of the ground and of the feasibility of the project, Judge Wright later engaged the services of Col. John L. Sullivan, a man of practical knowledge acquired in the superintendence of the Middlesex canal, Massachusetts, and of canals and works along the Merrimac river.

In December, Col. Sullivan, in company with Mr. Mills, again went over the route, following the valley of the Rondout from tide-water at Eddy's dam southwest between the Catskill and Shawangunk ranges to its head waters in a swamp at the summit, from which same swamp the waters of the Neversink found their way through Sullivan and Orange counties to the Delaware, to which point the survey continued. After reaching the mouth of the Lackawaxen, the survey proceeded up that stream, on which the positions for seventeen dams were located, and thence to Keen's pond by the West Branch, seven miles further.

Col. Sullivan's report, "To Benjamin Wright, Esq., Civil Engineer of the Erie canal, now at Philadelphia," is dated January 7, 1824, from which it appears that his estimates amounted to \$1,208,632.95, not including a railway from the mines to Keen's, which would cost from \$1,500 to \$2,000 per mile. Composite locks, constructed with stone backing, lined with successive layers of plank, tree-nailed to each other, each layer to be laid across the grain of the previous one and embedded in pitch, were advocated for economical reasons. Inclined planes and perpendicular lifts, which are elsewhere sufficiently described, were discussed, as was also the water-supply.

Judge Wright promptly transmitted the estimates of Messrs. Sullivan and Mills to Maurice and William Wurts on January 19, 1824, with his approval. The construction of composite locks would result in a saving of fifty per cent of the capital employed, and the perishable portions could be easily replaced without interrupting navigation. At the estimate given, the expense of the one hundred and seventeen miles would be \$10,330 per mile. On such portions of the line as were distinct from the canalization of river, the prism was computed at sixteen feet on the bottom, four feet of water, and thirty-two feet at water-surface. Locks were to be nine and one-half feet wide by seventy-five feet between gates, admitting boats of nine feet beam and seventy feet in length, with a draught of three feet, loaded with thirty tons of coal. On more solid ground the prism might be reduced to eighteen feet at bottom and thirty feet at surface, giving a similar slope to that of the Erie canal. In this case the locks might be reduced to nine feet in width, for twenty-five-ton boats, which was said to be as much as one horse ought to draw in the canal.

These reports were subsequently transmitted to the commissioners named under the New York act of incorporation, together with certain "prefatory remarks of the proprietors of the coal mines" in question, descriptive of the location and value of the mines of Maurice Wurts and of the "Lackawanna Company," the latter term being thereafter frequently used in the documents. Whether the term refers to the coal lands of the Wurts brothers, or to adjacent lands of other owners, or to a combination including both, the material at hand fails to disclose.

On the seventh of February, the ubiquitous Col. Sullivan presented a letter to the commissioners, stating that he had seen a letter addressed by Mr. Hone to one of the mine proprietors, expressing a disposition on the part of the commissioners to receive any communication relative to the canal, and that he was induced to lay before them further considerations that could not, with perfect propriety, be brought into his report of the preliminary survey. The primary object of the canal, he said, was conceded to be the introduction of coal into the State of New York. The New Jersey canal commissioners had already broached the subject of the Morris and Essex canal, for distributing purposes. By the further improvement of fourteen miles of the Delaware river, above the Lackawaxen, the Delaware and Hudson company could extend navigation for a hundred miles westward, and still better results could be obtained by connecting with the Susquehanna river. As to the probable success of a coal canal, he stated that England at that time possessed twenty-six such canals, all financially successful.

"The proprietors of the coal mines having represented to the Legislature that it would be expedient that the whole line of improvement should be made by one company, to be organized under this act," on April 7 of this year, an amendment to the act of incorporation in New York was passed, increasing the capital stock to fifteen hundred thousand dollars, it being evident from the surveys that much more than the original half million would be required to build the canal. The powers granted by the original corporate act, over the line between the Hudson and Delaware rivers, were extended by this amendment along the latter river within the limits of the State from Carpenter's Point to the mouth of the Lackawaxen.

At the third meeting of the New York Legislature in 1824, a further amendment to the charter of the company was passed, under date of November 16, allowing them to use five hundred thousand dollars of paid-in capital in the business of banking, to establish a banking house in the City of New York, and to issue notes to the amount of fifteen hundred thousand dollars; on condition, however, that the canal should be commenced within six months after electing a board of managers, and that they should expend at least one hundred and fifty thousand dollars a year on construction, and should complete the canal from the Hudson to the Lackawaxen within seven years; the banking privilege to continue for twenty years only.

Reading between the lines, it may be plainly seen, however, that these preliminary stages of the enterprise were not passed without encountering opposition. Capital was not only scarce, but the support of the people at large had not yet been gained. Many were of the opinion that the scheme was impracticable, and the engineering difficulties of surmounting the necessary elevation of several hundred feet between the Hudson and the Delaware were regarded as insuperable.

Spafford, in his *Gazetteer of New York*, writing in 1824, reflects this popular attitude, saying in substance: "A good deal has been said among some very enterprising and intelligent individuals, about a canal across Ulster or Orange and Sullivan counties, making an artificial navigation between the Hudson and Delaware rivers. A prominent object in view, ostensibly, is to bring the coal of the Lackawaxen, a river of Pennsylvania, which puts into the Delaware opposite Lumberland, of Sullivan county, to the New York and Hudson river market. If practicable, I hope the plan will succeed, and the sooner the better, as coal, in plenty, is a grand desideratum, of immense importance to the people of this State. Without having any information, accurate, to be relied on, people generally doubt the practicability of making a canal on the proposed route, from vague ideas of the mountain character of the intermediate country."

The first board of managers was organized by the commissioners under provisions of the charter act, on March 8, 1825, by the selection of Philip Hone as President, and John Bolton, Treasurer. The managers were John Bolton, Philip Hone, Garret

B. Abeel, Samuel Whittemore, Hezekiah B. Pierpont, Rufus L. Lord, Wm. H. Ireland, Benjamin W. Rogers, John Hunter, Thomas Tileston, Wm. W. Russell, Wm. Calder and Henry Thomas.

Their first act was to engage the services of Benjamin Wright as engineer, and as his assistant, John B. Jervis, who had been trained to the profession under Judge Wright, and whose ample knowledge of its duties were said to do equal credit to his tutor and to his own talents. To these engineers the managers submitted the reports of Col. Sullivan and Mr. Mills, requesting a critical examination of the several lines proposed for a canal from the Hudson to the coal mines, so as to furnish revised and accurate estimates in order that the question of prosecution or abandonment of the project might be decided.

Another statutory act was secured on April 1, 1825, from the State of Pennsylvania, permitting the company, with the consent of Maurice Wurts, to improve the Lackawaxen and to operate the canal thereon and charge tolls, as provided in his concession, on filing with the Governor their acceptance of the act before July 1, 1825. The banking privilege, however, permitted within this State, was forbidden to be exercised in Pennsylvania. An amendment to the charter was at once secured on April 20 from the New York Legislature, giving the company the right to contract with Maurice Wurts or the owners of the Lackawaxen concession, and later, on June 21, the formal acceptance, signed by Philip Hone, President, and John Bolton, Treasurer, was duly filed with the Governor of Pennsylvania.

The engineers completed their surveys and estimates and reported to the managers. They recommended the construction of an independent canal throughout, instead of a canal simply between the great rivers and a slack-water navigation in the Rondout, Delaware and Lackawaxen rivers. They advised that the locks should be constructed of stone instead of wood. As the result of explorations on the line by an expert geologist, specially employed for the purpose, water-lime stone had been discovered in abundance, equal to that used for constructing the Erie locks; hence the change from wood to stone. Even in those days a trust or combination was formed by the owners of the limestone quarries, which was said to "somewhat enhance the price." This

more perfect system of navigation, affording greater facilities and less liability to interruption, together with the expense of the more permanent locks, was estimated to cost about \$1,600,000.

The managers examined the coal mines and the several routes proposed, and after deliberating upon the whole matter, decided to prosecute the work as recommended by the engineers, formally adopting the valley of the Rondout, in which to locate the canal from the Hudson to the Delaware river. They then concluded a bargain with the members of the Lackawaxen Company, as we are told, for the purchase of their coal mines and their rights and privileges in Pennsylvania for \$40,000, in cash, and deferred stock to the amount of \$200,000, which was to bear dividends only after two semi-annual dividends of three per cent each upon the original stock should have been declared and a clear surplus of \$12,000 should remain.

The line was divided into sections of a half mile each. Much time was spent in deciding upon routes and in preparing estimates, but seventeen miles were advertised to be let on July 13, 1825. On that date the ceremony of breaking ground upon the summit level, forty miles from the Hudson, was performed, the address being delivered to a large concourse of people by Philip Hone. Contracts were at once made and others followed, as the engineers completed the work of location, and on December 6, the last contract was signed for the line between Eddy's Factory, on Hudson tide-water, and Montgaup, on the Delaware, a distance of sixty-five miles. This portion of the work, passing through a valley by which at some remote period the Delaware is said to have poured its waters into the Hudson, was believed to include the most formidable, and to many people apparently insurmountable, difficulties on the whole projected line.

The sum of thirty thousand dollars was added to the estimates, to bring the Neversink river into the feeder system by a three-fourths-mile cut at the summit, affording increased water-supply and other advantages. The original estimate for the sixty-four miles from Hudson tide-water to Saw Mill Rift, on the Delaware, on the line first projected, was \$792,000. From the termination of the line under contract to the mouth of the Lackawaxen was a distance of about fifteen miles.

The managers determined to abandon the plan of a slack-water navigation in the Delaware in favor of an independent canal on the New York shore, but contracts on this section were deferred for fear of delaying work on that portion already under construction, and of thus preventing the completion of the link between the two rivers within the year 1826.

It would seem that the managers of that period, not satisfied with the work in hand, were already turning their attention toward a western extension of the enterprise—beyond the mouth of the Lackawaxen, up through the valley of the Delaware to where that river approaches to within twelve miles of the Susquehanna at the great bend of the latter river. As this locality was within the State of New York, a charter had been secured from the previous Legislature, giving authority to improve the navigation of the Delaware and Susquehanna rivers within certain counties in New York and to connect them by a canal or railway. Although this project was placed in the hands of a different set of commissioners, who, by the terms of the act, were to organize the "Delaware and Susquehanna Canal Company," it is not to be doubted that the Delaware and Hudson Canal Company was in full control of the enterprise. It was expected that the work would be undertaken when the canal should have been completed to the Lackawaxen.

Most of the contractors of the portion let were at work by September, 1825, and operations were pushed with vigor until the heavy frosts of December compelled cessation of all except deep cutting and rock blasting, which continued through the winter. At the close of the year the estimates for work done were \$68,006. Five hundred men were engaged on the line during the winter. Contracts were let for sixty locks of hammered stone, with cut hollow-quoins and coping. By February 28, 1826, \$123,000 had been expended.

In Pennsylvania surveys had been made, but no decision as to route had been announced. It was considered that secrecy regarding the exact plans of the company was necessary to their success. Even the stockholders were not informed concerning details at the annual meeting on March 7, 1826. By this time John Bolton had replaced Philip Hone as President, the latter

having resigned to accept the position of Mayor of New York City.

It was intimated that for economical reasons an inclined plane and railway would be substituted for a canal from the mines to the Lackawaxen. A certain statement of that period seems strange now; it was said that the coal produced was "of such a fine quality, so easy of ignition, and supported combustion so well, that a fire made of it could actually be graduated to the temperature of the weather."

As to the banking department of the company, although the directors had, by resolution, set aside half a million dollars for the purpose, it was not until January 25, 1826, that the treasurer had sufficient funds to authorize the entry of this appropriation on the books. Twenty-nine thousand dollars had been paid for a banking house in Wall street, New York.

On February 9, 1826, the Pennsylvania General Assembly authorized the company to construct the locks on the Lackawaxen "of such dimensions as they should deem expedient, provided they were of sufficient capacity to pass boats, arks and crafts at twenty-five tons burthen," and also provided that if the size should be reduced below that required by section fifteen of the original charter to Wurts, or eighteen feet wide by sixty-four feet long, then the method should be by canal and not by slack-water navigation; and the feed-water from the Lackawaxen should be discharged into the Delaware at the mouth of the former river. Later, on April 8, another privilege was also granted to the company by the General Assembly, authorizing them to connect their mines with the canal by railways, provided such railways should not obstruct public highways, and "overhead causeways" should be built for owners of lands crossed.

This connecting railway was at this time occupying much of the attention of the board and its engineers. In the summer of 1826, Judge Wright, then chief engineer, was requested to examine the matter with reference to the peculiarities of the country over which it must pass. On October 26, under instructions from Judge Wright, Engineer Mills began a survey and examination for an extension of the canal westward from the mouth of the Lackawaxen up the Delaware on the New York side as far as

Deposite, sixty-eight miles. Fortunately the original manuscript notes of this survey, with comments by Judge Wright's own hand, have been preserved. Judge Wright states that the survey was made by the request and at the expense of the company, and was part of an important plan of connecting navigation between the Delaware and Susquehanna rivers at a point in Delaware and Broome counties. The line connecting the rivers had already been surveyed. A curious feature of this report was that no stone of value for cutting was found along the line and the lock estimates were, therefore, based upon a wooden lining, backed by rough walls. The estimates for the line from Lackawaxen to Deposite were \$870,236.95.

The estimates for the connecting link, which followed up the valley of Oquago creek, passed through the summit of the dividing ridge by a tunnel one mile in length and descended along Johnson's brook to the Susquehanna near Bettsburg, appear to have been \$771,430. The tunnel, eighteen feet in diameter and lined with brick, was estimated to cost \$300,000. Six hundred and ten feet of ascent and descent were to be overcome by inclined planes, to cost \$122,000.

Judge Wright's comments, on submitting these estimates to the managers on January 3, 1827, are of unusual interest. The rugged handwriting and the clear vision of this able engineer reveal a mental grasp of transportation problems as they then existed, which was almost prophetic in its character. He considered that the construction of the line to Deposite, by opening a hitherto undeveloped section of the state, would present equal claims with the Erie canal to the protecting and fostering hand of the Government that should be extended alike to all its citizens. It was not doubted that, when well understood, the enterprise would be patronized and assisted by the Legislature.

But the route was not expected to stop at Deposite. In June, and again in October, 1826, Judge Wright had personally examined the entire line. He says: "This excursion satisfied me that Nature had formed a valley from the foot of Otsego lake to the western part of Steuben county, 220 miles, where a canal could be formed at comparatively small expense; where many towns and flourishing villages are already seen, and where a few more years will show a dense population. The project of an

extension up the Delaware, thence over to the Susquehanna and thence through the valleys of the Susquehanna and Tioga, is only second in importance to that of the Erie canal. The river valley improvements could be carried on, leaving the connecting link simply a good road, until by the ingenuity of the people, the development of modern engineering skill should find a better way of overcoming the elevation of the dividing ridge."

"This main line" was "but part of a great scheme of internal improvement by lateral canals," which he felt "sure would hereafter be executed along the valleys of the Unadilla; the Chenango and its branches; from Owego to Cayuga lake; from Newtown [now Elmira] to Seneca lake; and from the branches of the Tioga river to Canandaigua lake; thus opening communication with the Erie canal for the exchange of productions peculiar to each."

In his own mind, the increasing trade on the Erie and the throng of boats even then passing upon it, so soon after its completion, proved that not many years would elapse before that canal would be unable to accommodate the traffic of the growing states bounding on the Upper Lakes and western rivers, and he believed that the fifth year after the finishing of the Ohio canal would see the limit of tonnage capacity reached. The southern line would relieve this pressure. He considered that locks passing boats of twenty-five or thirty tons would accommodate an even greater amount of tonnage than those of the Erie canal, if the boats were made to fit them. In England, he said, it was well settled that narrow boats for canals were decidedly preferable.

By this time the available funds, aside from that portion reserved for banking purposes, which, by the limitations of the charter, could not in good faith be used for canal construction, were exhausted and the completion of the enterprise was problematical. A memorial was, therefore, addressed to the Legislature by the managers, asking the State to aid them to complete their canal. Of the various plans proposed for relief, the loan of the State's credit met with legislative favor and on March 10, 1827, by chapter 62, special certificates of stock to the amount of five hundred thousand dollars were authorized to be issued to the company, bearing five per cent interest and redeemable at the pleasure of the State after twenty years. The company was re-

quired to give a first mortgage on its entire lands and privileges in both states, and all premiums on the sale of stock were to be repaid to the State for the common school fund. The company was also authorized to raise the sum of three hundred thousand dollars in addition (if it could) upon second mortgage security. Notwithstanding these objectionable restrictions, the company decided to accept the terms as the best that could be obtained, and it proceeded with the work. It was admitted that the State loan had saved the situation and would insure the completion of the enterprise. The use of anthracite coal, not only for domestic purposes but for generating steam, was beginning to be understood and the managers were hopeful.

Work on the Delaware river section was urged forward, but was retarded by much wet weather and its completion was necessarily deferred until the following season. The Lackawaxen section, as far as the forks of the Dyberry, was placed under contract. This terminal was seven miles short of that originally planned, but economy demanded the change. A railway was projected from this point (now Honesdale) to the mines at Carbondale, about fifteen miles. In the meantime good turnpike roads were constructed by the company between the mines and the canal terminal and wagons were used temporarily to bring down coal. Unforeseen delays occurred in the construction of the Delaware-Hudson section. The banks were not well settled, or were made of porous earth and coarse gravel, permitting excessive leakage, and repairs were tedious. Water was finally admitted late in the season of 1827 and some boats passed from river to river, carrying lock irons and a weighing machine for use at Honesdale, the head of the canal. A few boats only extended their trip to Wurtsborough, forty miles from tide. Labor employed on construction was withdrawn from adjacent industries; few supplies were provided for market; wagons had transported all articles which would bear the expense and, as we are told by the managers, public expectation was greatly disappointed.

Engineer Jervis was directed by the board to prepare plans for a railway over the summits of the Moosic mountains, which towered some eight hundred and fifty feet above the river level. It should be remembered that at this time only one short railway of three miles, at Quincy, Massachusetts, had "endured the

test of the winter's cold," and one other was a temporary and imperfect work. English engineers differed as to constructive details, but, as President Bolton said, all were "agreed in their great superiority over turnpike roads, and in their near approach to canals in respect to cheapness and facility of transportation."

Mr. Jervis devised a very ingenious scheme of inclined planes, five of them ascending, worked by stationary steam engines, and three descending gravity planes. This plan was submitted to Judge Wright and Professor Renwick and upon their approval construction was ordered. Rails were ordered from England. They were to be flat iron straps, secured with screws to an underlying wooden sleeper. Engineer Allen sailed to Liverpool to superintend their manufacture and to procure locomotives. The total weight of iron rails was three hundred and sixty tons. In November, 1828, the Governor of Pennsylvania, having received the report of commissioners appointed to examine the Lackawaxen section, issued a formal license to collect tolls thereon.

Hough's *New York Gazetteer* (1872) says that the canal was considered open for use in October of 1828; we are elsewhere told (*Niles' Register*, Vol. 35, p. 130) that Philip Hone wrote to the president of the New York Senate, stating the fact that the canal would be opened at that time, and the managers invited a committee of the Senate to join the excursion of the first boats passing over the line from Honesdale to the Hudson. Other authorities also used this date. But engineer Jervis says, "In the autumn of 1829 there was some navigation on the canal and a few hundred tons of coal were transported to tidewater," and President Wurts, in his annual report on March 5, 1833, says, "the canal of this Company was first opened for navigation in October, 1829, and 7,000 tons of coal passed through it." This may be regarded as conclusively fixing the date of opening.

The financial resources of the company were again at low ebb. The New York Legislature was again asked to come to its assistance by a further loan. On this application, State Comptroller Marcy informed the Legislature of the practical completion of the canal, from his personal observation, although the river sections were not yet filled. The Assembly committee having charge of the matter reported that, because the State had required a first mortgage on the entire property in order to secure the first

loan of its credit, the company was rendered unable to offer sufficient security to obtain the additional three hundred thousand dollars authorized by the act of 1827. On May 2, 1829, by chapter 346, the Legislature authorized the issue of three hundred thousand dollars in additional certificates of stock, bearing four and one-half per cent interest, redeemable after twenty years, but again exacted a second bond and mortgage as security for the loan. Our space forbids more than a brief mention of the glowing tribute paid by the committee to the enterprise of the company and to the excellent character of its work, which should be considered, in a measure, as of great public benefit. Incidentally, we are told that the company had imported the first and only locomotive engines as yet introduced into this country.

Reinforced financially by this second loan from the State, the efforts of the company were again bent toward the completion of the entire line. At this time Mr. Jervis, as chief engineer of the company, was in charge in place of Judge Wright, who had resigned. The railroad, commencing at the mines, was carried to the summit level by five planes in about three miles. Chains, passing over sheaves, and steam-power from stationary engines were first used for ascending cars. Later, these chains broke and were replaced by rope, which in turn gave place to steel cables. After passing the summit level of a mile and a half, there came a sharp descending plane of nearly five hundred feet within a mile. To retard motion on the steep, descending grades, Mr. Jervis invented a simple yet curious contrivance of sails connected with the gearing, which, revolving in opposite directions, successfully held the cars back to a velocity of about four miles per hour. On the lower grades at the river end of the line, the locomotives brought from England were intended to be used. On August 8, one of them, the "Stourbridge Lion," which at the present day has become well known from its exhibition at various points throughout the country, was placed upon the rails at Honesdale for its trial trip, in charge of Engineer Horatio Allen. The trip was made successfully, but it was found that the weight of the locomotive was too much for the road, as constructed, and it was withdrawn from service. Horses and mules were substituted and later these were replaced by steam and gravity. The completion of the canal was practically accomplished, and vigorous

efforts were also made to mine and transport the company's products. As before stated, some 7,000 tons of Lackawanna hard coal found its way to tide-water during the year.

The numerous authorities at hand differ slightly as to the details of construction, the length of the line being variously stated as from one hundred and five to one hundred and eighty miles. From the reports of the company and from legislative documents of the period, it is given as fifty-nine miles from Kingston to the Delaware river (now Port Jervis); twenty-two miles on the Delaware river; twenty-five miles on the Lackawaxen to its Honesdale terminus. This makes one hundred and six miles of canal, the system ending with sixteen miles of railway to the mines. The prism of the canal was twenty feet wide at bottom and twenty-eight feet wide at water-line, according to Mr. Jervis, although Mr. S. H. Sweet, in his *Documentary Sketch of the New York State Canals*, gives it as thirty feet in width. The depth of water was four feet. It was intended to pass boats seventy feet long, drawing three feet of water and carrying from twenty-five to thirty tons of coal, which could be drawn by one horse. The locks, of which there were one hundred and ten in all, were built nine feet wide by seventy-six feet long in the chamber. Sixty of these, on the Kingston-Port Jervis section, were of hammered stone, the balance being "composite," or with chambers of wood backed by stone walls. The total elevation overcome by locks was ten hundred and seventy-three feet. The summit elevation of the land line was five hundred and eighty-five feet above tide, with a total rise and fall on that section of nine hundred and fifty feet. The Rondout was crossed by a stone-arched aqueduct, the other rivers by wooden trunks upon stone piers and abutments. The Delaware, at the confluence of the Lackawaxen, was crossed in slack water, formed by a dam; one hundred and thirty-seven bridges were required.

The coal brought to market in 1829 was surface coal of inferior quality. Its use led to considerable public prejudice, which the company with difficulty endeavored to dispel.

In 1830 the New York Legislature, which had tied up the company's property so completely that they could not sell a village lot, passed an enabling act (chapter 34), by which they were permitted to do this, and to build up their terminal points. Mr. John

B. Jervis appears to have resigned during the year, being succeeded by Mr. James Archbold as superintendent of mines and railways, and Mr. Russell T. Lord being appointed general superintendent of the canal. On March 23, the General Assembly of Pennsylvania authorized an agreement to be made releasing the company from building a river lock in their dam across the Delaware, until required by the Commonwealth to do so. In return for this, the company agreed to connect their canal with the Delaware canal system of Pennsylvania, when required. This agreement was duly executed. The New York Legislature, by chapter 212, appointed the Manhattan Company of New York as transfer agent for State stock, thus making it marketable. Business was systematically commenced and 43,000 tons of a superior quality of coal were shipped to market.

In 1831 the railway transported 54,328 tons from March 20 to November 5, without interruption. The canal was open from May 1 to December 1. 52,578 tons left Honesdale; 1,000 tons were caught en route by closing ice; the balance reached tide-water. The canal tolls for the year were \$19,394.05; the railway tolls were \$1,160.59. The total sales of coal, including reserve supply, were over 70,000 tons, a clear profit of \$34,000 being shown.

On March 23, 1831, a special meeting of the stockholders authorized the company to borrow, on the pledge of the company's credit and property, a sufficient sum to pay its remaining indebtedness. The company's credit was in a depressed state and terms were unfavorable, but finally a seven-year loan of \$300,000 at six per cent was placed. This was at once applied to the payment of their indebtedness, but it was found that there were still \$75,000 of debts outstanding. A supply of 18,000 tons being still on hand at tide-water and the business being so prosperous for the year, the company was enabled to take care of most of these claims. Agents were sent out to all manufacturing establishments to obtain a trial of hard coal and to point out the best method of using it.

The balance sheet for this year exhibits some interesting entries :

Amount of capital stock paid in.....	\$1,445,395 00
New York 5 per cent loan.....	500,000 00
New York 4½ per cent loan.....	300,000 00

Six per cent loan.....	\$300,000 00
Temporary loan.	25,000 00
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Amount charged to New York section of canal..	\$1,984,934 37
Amount charged to Pennsylvania section of canal	579,129 80
Amount charged to railroad in Pennsylvania....	310,852 21
Due on canal boats, to be paid in coal freights in 1832.	30,800 94
Packet boats.	3,712 90
Steamboats and barges.	20,723 58
<hr/>	

Tons of merchandise transported in 1831, 11,872.

Ninety thousand tons of coal and three million feet of lumber were sent down over the railway in 1832. The amount of business was claimed to be greater than that of any other railway in the United States for the period. Carbondale and Honesdale, five years before nothing but pine forests, now contained 2,000 and 1,200 inhabitants, respectively. Being scarce in New York during the previous winter, anthracite coal had brought from twelve to seventeen dollars per ton. In midsummer an epidemic of cholera proved a serious drawback, but the company was compelled to build additional boats on the western canal, getting them to Rondout late in the season. Locks were operated day and night, and premiums were offered for quick trips. Mining was continued throughout the ensuing winter in order to increase the next year's output, and dividends cheered the hearts of the stockholders at Christmas time.

A general business depression of the country, which extended over most of the seasons of 1833 and 1834, greatly embarrassed the company's operations. In anticipation of increased sales, the shipments were largely increased early in 1833 and the season closed with a record of 111,177 tons brought down. But manufacturers canceled previous orders, sales were difficult and the company was left with an enormous overstock. This compelled restricted mining in 1834, only 43,700 tons being forwarded. Although the Christmas dividends were suspended, this reaction probably left the affairs of the company in a healthier condition. Incidentally, it may be noted that dividends were not again resumed until 1839.

During the next decade, the managers struggled with varying fortunes and persistent effort to place the affairs of the company on a firm financial basis. Manufacturers and users of steam-power were slow to appreciate the qualities of Lackawanna anthracite for their purposes. Bitter opposition was encountered from older and better established rivals, who contested every inch of the field, endeavoring to disparage the quality of their product and to discredit their motives. The contest was carried even into the financial arena of Wall street and speculative assaults were at times made upon the capital stock of the company, which caused its owners anxiety and embarrassment. Combinations of miners, laborers, strikes and "turn-outs" began to be noticed. On two occasions the business of the season was limited by an epidemic of cholera which broke out along the line. Shipments of coal, however, steadily increased with the widening of their market. Dividends of eight per cent per annum were resumed in 1839, and with the exception of 1842, when ten per cent was divided, were maintained for many years.

In the early 'forties their output of coal was seen to be crowding their transportation facilities and improvements were planned. Engineer James Archbold, of the mines and railway, improved the latter by reducing grades, doubling tracks and substituting more stationary steam-engines in the place of horse-power, dispensing with the use of one hundred and ten horses and mules, besides men and boys to manage them. These engines, however, were soon displaced by water-power, in the interest of economy, mules and horses being still used upon the summit levels.

Improvements running through several years were made upon the canal sections—by deepening the bottom and raising the banks so as to obtain a five-foot depth of water and an increase to forty tons in the capacity of boats. Years after this, a similar plan, known as the "Seymour plan," was advocated for improving the Erie canal. The sides of boats and the walls of the locks were also raised. These improvements, extending from Honesdale to Rondout, were in charge of Engineer R. F. Lord, who had been identified with the company since about 1830.

In 1840, 148,480 tons were brought down the canal and a net profit of eleven per cent was shown on the year's transactions. In 1844 the banking charter expired, and the company did not

ask for an extension, becoming thereafter simply a canal and coal company. The powers granted by the original charter were extremely broad, authorizing an increase of capital stock by a resolution of the managers, at their discretion. Additional scrip stock appears to have been issued to meet these and other improvements and to wipe out the bank circulation. To obtain five feet and six inches of water, carrying boats of fifty tons burden, was at this time the object of the company. It was noted in 1846 that, for thirteen years, all locks on the canal had been closed on the Sabbath.

In 1848 the construction of the Erie railway and its rock-blasting operations along the Delaware interfered with the safety of boatmen; this produced much friction and legal complications ensued. Much delay had been caused by floods and ice at the river crossing above the Delaware dam at Lackawaxen. Aqueducts, suspended by wire cables, were built by Mr. Lord, which obviated this difficulty.

More radical enlargements were begun even before the completion of the others. Locks were rebuilt, ninety feet by fifteen feet, instead of seventy-six feet by nine feet. Six feet of water was to be the minimum, and in 1850 this work had so far progressed that boats averaging ninety-eight tons were the rule, and this was to be raised to one hundred and ten tons. The State loans, due in 1848 and 1850, were promptly paid without extension and the company stood free from outside indebtedness. The original privilege given to Maurice Wurts for improving the Lackawaxen being about to expire, negotiations were begun and finally in 1852, after extended controversy, the Pennsylvania General Assembly released its claim under the "resumption clause" in perpetuity to the company. Maurice Wurts, conceded to be the originator of the company and the one whose name had been associated with its interests since its earliest inception, died in 1854.

The company's profits were now enormous, ranging from ten to twenty-four per cent net, per annum, on its already doubled capital. In 1847 part of its canal capacity had been leased to the Pennsylvania Coal Company, the tolls from whose boats, in addition to its own, swelled its coffers. By 1858 the railway was extended down the valley of the Lackawanna six or seven miles

to other coal mines in Blakesly, and a \$300,000, seven-per cent, five-year bond-issue was made to meet the expenses. The whole funded debt was now \$900,000 and the capital stock was \$7,500,000. In 1864 the capital stock appears to have been raised to \$10,000,000 and on this amount the next year's statement showed thirty-one per cent net earnings.

Ten years later a corresponding advancement in the affairs of the company was shown. Other coal properties were developed and leases and connections established. Its markets and its business were extended and it was sending coal down the Susquehanna to Baltimore. Five millions more had been added to its capital and it was authorized by law to construct telegraph lines along its property. By a contract with the Erie company to build a connecting link of railway from Susquehanna, Pa., to Nineveh, N. Y., the markets of Rochester and Buffalo were opened to its products and delivery was also made at its Weehawken docks during the winter months.

The gravity railroad from Carbondale to Olyphant was to give way to a modern, double-track locomotive-railway and a lease in perpetuity, obtained of the Albany and Susquehanna railroad, gave it an opening to the North and East. This was followed by the absorption of the Rensselaer and Saratoga railroad under lease and by the building of a new line to Canada on the west side of Lake Champlain, opening still more extended markets to the North. And still the average annual net earnings appear to have been in the neighborhood of ten per cent on the entire capital.

In 1904 its mileage operated was said to be eight hundred and forty-three; its coal tonnage 9,515,347, or 53.97 per cent of its total tonnage; its net earnings (excluding taxes) \$6,214,672; its dividends, at seven per cent, \$2,756,162. The total shipments of anthracite coal in that year were 57,492,522 tons, and 9.6 per cent of this amount was allotted to the Delaware and Hudson Company.

It is not within the province of this article to trace the modern history of this remarkably successful enterprise as a railway organization, whose extended markets, enormous resources and complicated interests now completely overshadow the modest requirements and facilities of its original line of transportation over the mountains to Rondout on the Hudson. The Delaware and

Hudson canal, physically considered, has served its wise purpose in the economy of human progress. The slender thread of its stream, which in other days bore riches to those who by wisdom, integrity and shrewd business management upheld its growing fortunes, peopled its valleys, planted cities and towns in place of forests and scattered with lavish hand the blessings of civilization and commerce along its entire line, has given way to the inevitable, and the black diamonds of the Lackawanna now reach the markets of the world by other means and through other channels. Suffice it to say that in 1899 its corporate name was shortened to "The Delaware and Hudson Company" by a legislative enactment which allowed the company to abandon its waterway, saying, "whenever it shall appear to the managers that they can fulfill the purpose of mining and bringing to market stone coal more economically by railroad than by canal, they may do so, and they may also lease, sell, discontinue to use or maintain said canal or any parts thereof," by restoring highway crossings and feeder streams to their natural courses. Soon after the passage of this act the entire bed of the canal was sold to private parties, later passing into the hands of other railway corporations. Portions of its bed, locks and other works are now occupied by railway lines and structures. Here and there an undemolished lock wall, or a section of its abandoned prism, are the only physical vestiges of that once famous waterway, which was built to open the markets of New York to the coal beds of northeastern Pennsylvania.

CHAPTER XXI.

THE JUNCTION CANAL.

The survey of the route by the State in 1839; the incorporation of a private company; the building of the canal by this company, and its final abandonment.

In 1846 the Junction Canal Company was incorporated for the purpose of constructing a navigable communication to unite the canal systems of the States of New York and Pennsylvania, the waterway to extend from the Chemung canal at Elmira to the northern terminus of the North Branch canal at Athens, Bradford county, Pennsylvania.

Unlike the Cayuga and Seneca, and the Oneida Lake canals, which, after being built and operated for a while by private companies, soon passed into the hands of the State, the Junction canal was under the management of an incorporated company during its entire existence. It was known locally as "The Arnot canal" or "Arnot's canal," from John Arnot, of Elmira, the chief stockholder.

As we have seen in the story of the Chemung canal the subject of connecting the waters of New York and Pennsylvania by means of a canal from the Susquehanna to the head waters of Seneca lake had received early attention. After the completion of the Erie canal there soon followed the construction of the Cayuga and Seneca, and a little later the Chemung canal, which formed a water communication from the Erie at Montezuma to Elmira, the southern terminus of the Chemung route. The Junction canal was the last link in the chain of communication between the canal systems of the two States.

In 1839 the inhabitants of Chemung county became so solicitous for the State to undertake the making of this connection with the Pennsylvania canals that they petitioned the Legislature for favorable action. It was claimed that such a connection would afford the shortest, cheapest and most feasible route, through which the internal commerce between central Pennsylvania and

central and western New York could be carried on. It was argued that thousands of tons of coal would be brought over this route from the great anthracite coal region of the Susquehanna to supply the cities, the flourishing villages and the salt works of New York, and that there would be an extensive interchange of commodities between the citizens of those States, which would be highly advantageous to both.

Interest in the proposed canal was intensified by the action of the Pennsylvania Senate in appointing a committee to confer with the authorities of New York State concerning the building of a waterway from either the Chemung or Chenango canals to connect with their systems. The conference was held in Albany, in April, 1839, and had the effect of bringing about the enactment of a law (chapter 306) by the New York Legislature, which says that "the canal commissioners shall cause a route for the continuation of the Chemung canal to be surveyed, from its present termination near Elmira, in the county of Chemung, along the valley of the Chemung river, to the State line near Tioga Point, at the termination of the North Branch canal of Pennsylvania." The law also directed the commissioners to transmit to the Legislature at its next session a report of the survey, with an estimate of the cost of construction.

An act (chapter 292) had been passed by the Legislature of 1838, authorizing a survey from the Chenango canal to the State line near Tioga Point. An account of this survey and of the subsequent attempt to open a canal along this route has been given in the chapter describing the Chenango canal extension.

Pursuant to the act concerning the Chemung extension the report was submitted to the Legislature of 1840 by the canal commissioners, who stated that Joseph D. Allen, a civil engineer, had been appointed by them to make the survey and estimate of cost for a canal of the following dimensions: depth of water, four feet; width at bottom, twenty-six feet; width at water-surface, forty-two feet; the banks to be three feet above the surface of the water, with slopes of two feet horizontal to one perpendicular, in front and rear; the width on top of the towing-path bank to be twelve feet, and the width on top of the berme bank, seven feet; the locks being estimated on plans for composite, stone and wooden structures.

Preparatory to the survey, an examination was made of the land from Elmira to the State line, and as it appeared to be proper to have a survey made on each side of the river, the engineer was directed accordingly. The lines surveyed passed over land favorable for the construction of a canal and the engineer was of the belief that there would be no rock cuttings upon either of the routes.

At the beginning of the south route two lines were traced from the Chemung canal across the Chemung river to a point upon the south shore, where it was proposed to locate a guard-lock and to pass out from the river. The first line commenced on the north bank of the river at the terminus of the Chemung canal and passed directly across the stream, the plan being to construct a dam in order to form a pool. The line then led along the south bank in the channel of the stream to a point about half a mile below the terminus of the Chemung canal, where the two lines united in the main south line and left the river. The other line began at a point one mile above the termination of the Chemung canal, and then, after passing through the east side of the village of Elmira, crossed the river below the bridge in the pool of the proposed dam and joined with the first line.

From here the canal on the south line would traverse a broad intervalle and then, bearing around a little to the left it would approach Mill creek. Crossing this stream, the channel would occupy the immediate bank of a branch of the river, flowing around the westerly side of Big Island, and continuing along the smooth, flat ground for a distance of half a mile, another stream, Seely creek, would be crossed upon an aqueduct, the line from here extending to a hill on the south side of the Chemung valley. Continuing along the foot of the hill the line reached Bentley creek, which was to be crossed by an aqueduct, and twenty chains further on, at the village of Wellsburg, a portion of the canal would occupy the river, requiring a high embankment with slope wall protection, then after occupying the river flat for a distance of three miles, it would again encounter the stream. Leaving the latter, the canal would extend over an alluvial flat at the foot of an elevated plain, thence in the river again for thirty chains, subsequently leaving the river, the distance from this point to that proposed for uniting with the North Branch canal at the

State line being seventeen chains. The shape of the ground was in all respects favorable for forming the contemplated connection, being a regular flat, forty chains in width and sufficiently elevated above the river to be secure from the highest floods. The south line was 12.62 miles long and would require forty-one feet of lockage.

The north line, which was located on the north side of the Chemung river, began at a bend in the Chemung canal, nearly a mile above its termination, and pursued a direct course toward the east side of the valley, which it reached at Tuttle's mills, situated upon Newton creek near its junction with the river. After passing the creek the canal would occupy the river flat, following for one and a half miles along the foot of the main hill which bounded the valley on the north, and then would be brought down to the edge of the river and continue under a high upland bank for the next half mile; after that, the canal would extend over a smooth plain, finally being again forced upon the bank of the river, which it would continue to occupy for a distance of one and a half miles. Leaving the stream, the line passed over a broad flat, advantageous for a canal, and extended to Baldwin creek, which would be passed upon an aqueduct. Below the mouth of the creek the river would again be utilized, and then the canal would continue over regular ground to the Chemung narrows. Passing this place, where the canal would be forced into the river, the line was traced along the foot of an elevated plain down to a point in the plain which was least elevated, where an excavation averaging twenty-four feet deep for nearly half a mile would be necessary. In order to keep within the limits of the State, the course was made parallel with the State line, then extended directly across a plain and approached Wynkoop creek, which would require another aqueduct. From here the line continued until it reached Shepard's narrows, through which the canal would occupy the river, and on leaving the stream would enter upon a narrow flat, following along the base of a ridge the remaining distance to the proposed point of connection with the North Branch canal.

The ground below the State line presented a very regular shape down the valley and was favorable for the approach of the Pennsylvania waterway to the point of termination. The north line was 17.32 miles in length and had a lockage of seventy-five feet.

In his report the engineer also furnished information as to the most available water-supply for whichever line should be adopted. In both cases the Chemung river was deemed the most feasible source, a supply to be drawn for the south line from the pool above the dam, which it was proposed to construct at Elmira, and a supply for the north line to be impounded by erecting a dam at some point along the route.

The engineer's estimate of the cost of the canal, with the various styles of locks, were as follows:

South line,—composite locks, \$271,648.31; stone locks, \$275,984.05; wood locks, \$266,390.05.

North line,—composite locks, \$391,056.67; stone locks, \$398,987.92; wood locks, \$381,437.92.

The Assembly committee on canals, to which was referred the report, had before it numerous petitions, the people renewing their urgent appeals for the extension of the Chemung canal. The committee stated that the route had merits not surpassed by any canal then in contemplation in this state, but, owing to the unsettled condition of monetary affairs, which made the raising of money a difficult task, the propriety of starting this new work at that time was questioned. However, the committee offered a resolution to the effect that, whenever the State should be prepared to begin any new work, the extension of the Chemung canal should stand among the first of those to receive legislative sanction.

As the years passed away and the State made no attempt to build the canal, several business men of Elmira became interested in a movement for consummating this project, and petitioned the Legislature of 1846 for an act of incorporation, authorizing the construction of a canal or railroad to connect the Chemung canal with the Pennsylvania canal system. The members of the Assembly committee, having the petition under consideration, expressed their belief that a canal to connect those points would be preferable to a railroad, and a bill incorporating the Junction Canal Company, with a capitalization of \$500,000, was introduced and passed, becoming act (chapter 194).

The company was "authorized and empowered to make, construct and forever maintain a canal or slackwater navigation of suitable width, depth and dimensions to be determined by the

said corporation." The law provides that "the tolls shall not in the whole exceed the rate of two cents and five mills per mile for every ton weight of the ascertained burthen or capacity of any boat, ark, craft or vessel, laden with or engaged in the transportation of coal, salt or plaster." By the act the company was permitted to take such land as should be desired upon the payment to the owners of a money consideration, and in order to avoid delays in navigation the law made it mandatory for those in charge of vessels of all descriptions passing through the canal, to blow a trumpet or horn within one-fourth of a mile from any lock, so that the attendant could be apprised of the approach of boats and have the lock in readiness for their passage.

The company procrastinated in the matter until the failure to begin construction compelled the enactment of chapter 369 in 1852, which renewed the corporate powers. As it would be necessary to extend the canal below the State line, the Pennsylvania General Assembly in 1852 passed a law granting the company permission to build the waterway through such portions of Bradford county as it should consider expedient to secure a direct and convenient route.

The company was finally organized, a majority of the stock having been subscribed, and work was begun. In April, 1853, for the purpose of aiding in a more speedy completion of the work, which already was under headway, the Legislature passed an act (chapter 236), making it lawful for the company whenever \$400,000 of the capital stock had been subscribed and thirty per cent of it had been paid in and expended on the work, to issue bonds, secured by a mortgage on the canal, for a sum not to exceed \$150,000.

After the line had been located, proposals were advertised for, contracts were let, and in March, 1853, the first ground was broken at a point about three miles southeast of Elmira. Then quickly followed the work of construction all along the route, and the main portion of the canal was completed in 1854, the waterway extending about eighteen miles along the north side of the Chemung river, affording slack-water navigation except at points where the river was obstructed by rapids and narrows.

In this year the Legislature by act (chapter 227) authorized the canal board to permit the connection of the Junction canal,

at its westerly termination in Elmira, as then constructed, with the Chemung canal. The volume and flow of water from the canal to the new line was, by the law, to be under the exclusive control of the canal commissioners.

It was not until 1858 that the Junction Canal Company had its line throughout in operation. The size of the canal, according to a report of the company to the Pennsylvania authorities in 1867, was sixty-five feet at water-line, twenty-six feet at bottom, and four feet in depth, while there were eleven wooden locks of ninety by seventeen feet, having a total lockage of seventy-two feet. The dimensions were given in a report of the company in 1869 as being seventy feet at water-line, twenty-six feet at bottom, with a depth of four and a half feet. The canal was eighteen miles long, having five miles of slack-water navigation. There were three dams and two aqueducts on the route. The cost of construction is reported as \$530,637.

The route was in use for about thirteen years after its entire completion, during which time it was an important tributary to the New York State canals, and the company received gratifying returns. In 1866 by a special act (chapter 570) of the Legislature the name of the company was changed to the Junction Canal and Railroad Company, and the officials were authorized to construct a railway if they so desired.

The neighboring railroads gradually absorbed the transportation of coal and other products. Traffic on the terminal canals diminished. In 1865 the North Branch canal, the Pennsylvania connection, was nearly destroyed by a flood, and although ineffectual attempts were made to repair the damage, the canal was never again opened but was supplemented by a railroad built along the berme bank, which was completed in 1869. The Junction canal was operated for a part of the season in the autumn of 1871, and was then closed and abandoned.

CHAPTER XXII.

CANAL COMPANIES INCORPORATED BY NEW YORK STATE.

A tabular list of companies chartered for constructing navigable canals within New York State.

In addition to the two waterways whose histories have just been related, many companies have been incorporated by the Legislature to build other canals. These companies are here presented in a tabulated list, which gives the name, date of incorporation and capitalization of the company, the location of the canal and also a brief account of what was accomplished, so far as a rather extended research can ascertain. Possibly some of the companies, which are described as having done nothing, may have begun a part of the construction, but it is probable that if much had been done some record of the operations would have been found. Chronologically the list begins with the Inland Lock Navigation Companies, whose works were finally acquired by the State, as were also several others started by private enterprise. It will be noticed that the period of greatest activity in canal-building on the part of the State, or between 1815 and 1840, was productive of the keenest desire on the part of individuals to share in the profits of a toll-collecting canal. However, it will be observed also that some companies have been incorporated within comparatively recent times. The list contains three canals that were authorized by the State to be constructed by an unincorporated company or by municipalities. Projects for purely hydraulic or drainage canals are not included. The spelling of the statutes is retained for the names of companies and termini.

TABLE OF COMPANIES WHICH HAVE BEEN INCORPORATED FOR CONSTRUCTING CANALS AND EXTENDING NAVIGATION IN NEW YORK STATE.

COMPANIES.	Date of incorporation.	Capital.	Connections.	Remarks.
Albany and New Baltimore Ship Canal and Basin Co.	April 12, 1853	\$1,000,000	Albany and New Baltimore.	Survey made. Never built.
Allegheny River Slack-water Navigation Co.	April 7, 1857	30,000	.....	To improve Allegheny river below Olean. Nothing done.
Allegheny Slack-water Navigation Co.	May 1, 1839	100,000	.....	To improve Allegheny river from Olean to Pennsylvania State line. Nothing done.
Auburn Canal and R. R. Co.	April 24, 1832	150,000	Auburn and Erie canal.	Nothing done.
Auburn and Owasco Canal Co.	April 21, 1828	100,000	Auburn and Owasco lake.	Nothing done.
Auburn and Owasco Canal Co.	Mar. 30, 1832	100,000	Auburn and Owasco lake.	Charter renewed in 1834; not finished.
Binghamton, Owego and Pennsylvania Slack-water Navigation Co.	April 9, 1855	100,000	Southern terminus of Chenango canal to Pennsylvania State line.	Act amended in 1857.
Black River Canal Co.	Mar. 20, 1828	400,000	Erie canal and Black river	Nothing done.
Black River Co.	April 17, 1832	900,000	Rome and Ogdensburg.	To construct a railroad or canal. Nothing done, but the Black River canal fulfilled the needs.
Black River Navigation Co.	April 5, 1810	10,000	Brownville and Lake Ontario.	Not constructed.
Cassadaga Navigation Co.	April 16, 1827	20,000	.....	To improve Cassadaga creek; not completed.
Catetunk Lock Navigation Co.	Mar. 3, 1815	70,000	.....	To improve Catetunk creek from its mouth to northwest branch. Nothing done.
Chenango Junction Canal Co.	May 12, 1846	1,000,000	From Chenango canal at Binghamton to Pennsylvania State line.	Nothing done by company. The State undertook the work in 1863, but the line was never completed.
Chittenengo Canal Co.	Mar. 6, 1818	30,000	Chittenengo village and Erie canal.	Assumed by the State and used as a navigable feeder to Erie canal.
Delaware and Hudson Canal Co.	April 23, 1823	500,000	Rondout, N.Y., and Honesdale, Pa.	Capital stock increased to \$1,500,000 on April 7, 1824. Canal completed in 1829; in operation till close of navigation, 1898. Abandoned Jan., 1899. A few miles still open.
Delaware and Susquehanna Navigation Co.	April 20, 1825	500,000	Delaware and Susquehanna rivers.	Nothing done.
Ellicott's Creek Slack-water Navigation Co.	April 23, 1829	5,000	.....	Nothing done.
Foster's Meadow Canal and Dock Co.	April 18, 1859	5,000	.....	From Hook creek, where it empties into Jamaica bay, to a point in town of Jamaica.
(Gowanus Canal)	April 24, 1837	.....	Gowanus bay and Hudson river.	City of Brooklyn authorized to construct canal. Partially improved.
Great Chazy Navigation Co.	May 11, 1836	5,000	Lake and lower bridge at Champlain.	.....
Granville Canal Co.	April 18, 1825	200,000	Champlain canal and Bishop's Corners.	Nothing done.
Harlaem Canal Co.	April 18, 1826	350,000	Harlaem creek and North river.	Partly done and abandoned.
Harlaem River Canal Co.	April 16, 1827	500,000	Spuerdelvel creek and Harlaem river.	Surveyed but not constructed.
Hudson and Harlem River Canal Co.	May 2, 1813	100,000	Hudson and Harlem rivers.	.....
Hudson and Mohawk Lock Navigation Co.	April 17, 1816	500,000	Coboes Falls and Schenectady.	Nothing done.
Hudson's River Canal and Channel Co.	April 4, 1806	3,500	.....	For raft navigation on upper waters. Nothing done.
Ithaca and Port Renwick Railroad Co.	May 8, 1835	15,000	Fall creek to Cayuga lake.	Company which was incorporated April 16, 1834, to build railroad from Ithaca to Cayuga lake, was authorized in 1835 to construct canal. Nothing done.

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TABLE OF COMPANIES WHICH HAVE BEEN INCORPORATED FOR CONSTRUCTING CANALS AND EXTENDING NAVIGATION IN NEW YORK STATE—Continued.

COMPANIES.	Date of incorporation.	Capital.	Connections.	Remarks.
Jamaica Canal and New York Inland Navigation Co.	April 18, 1859	\$10,000	From Gravesend bay to Jamaica village.	
Jefferson County Canal Co.	April 15, 1828	300,000	Carthage and Sacketts Harbor.	Nothing done.
Junction Canal Co.	April 21, 1828	100,000	From Erie canal near Champlain Junction to Hudson river.	Constructed at a cost of \$21,417.16. In 1840 the State was authorized to purchase canal probably never purchased.
Junction Canal Co.	May 11, 1846	500,000	From Chemung canal at Elmira to Pennsylvania State line to connect with North Branch canal.	Completed in 1858. Abandoned in 1870.
Long Island Canal Co.	April 15, 1828	200,000	To connect Gravesend, Jamaica and Great South bays as far as Fire Island inlet.	Nothing done.
Long Island Canal and Navigation Co.	April 8, 1848	300,000	To connect Gravesend and Jamaica bays with Great South bay, and to cross Canoe place to Peconic bay.	Nothing but survey done. Shinnecock and Peconic canal later built by State at Canoe place; authorized in 1884.
(Main and Hamburg canal).	Mar. 27, 1838		Main street to Hamburg street, Buffalo.	City of Buffalo authorized to construct canal. Partly built by City. State assumed work in 1840 and later completed canal. Abandoned in 1898.
Manlius Canal Co.	April 15, 1828	50,000	Erie canal and Manlius canal or slack-water navigation.	State canal feeder.
Neversink Navigation Co.	April 16, 1816	50,000		The project failed. The State loaned its credit for \$10,000 and lost the whole sum.
Newtown and Flushing Canal Co.	April 22, 1808	100,000	Newtown and Flushing creeks.	
New York and Sharon Canal Co.	April 19, 1823		From Sharon, Conn., to tide-water at any point on the Hudson or in the City of New York.	Surveyed nearly on the present line of the Hudson R. R.
Niagara Canal Co.	April 5, 1798		Lake Erie and Lake Ontario.	Route first surveyed in 1796, resurveyed after incorporation. Nothing further done.
Niagara Canal Co.	April 11, 1823	120,000	From Niagara river, above the falls, to Lewiston.	Nothing done but survey.
Niagara Ship Canal Co.	July 21, 1853	5,000,000	Lake Erie and Lake Ontario	Nothing done.
Niagara Ship Canal Co.	April 24, 1860	6,000,000	From a point on Niagara river above falls to a point below on the river or upon the shore of Lake Ontario.	Nothing done.
Northern Inland Lock Navigation Co.	Mar. 30, 1792		Hudsons river and Lake Champlain.	Work commenced but no part completed.
Northern Slack-water and Railway Co.	May 13, 1846	2,000,000	Port Kent and Boonville.	Nothing done.
Oneida Lake Canal Co.	Mar. 22, 1832	40,000	Oneida lake and Erie canal.	Finished in 1835 at a cost of nearly \$50,000, and purchased by the State in 1841, for \$50,000.
Onondaga Canal Co.	Nov. 25, 1824		Erie canal and Onondaga Hollow.	Not constructed.
Ontario Canal Co.	Mar. 31, 1821	100,000	Cannadagua lake and Erie canal.	Nothing done.
Orange and Sussex Canal Co.	April 9, 1824	600,000	From Columbus, on the Delaware, through Orange county, to the Hudson.	The right granted in 1828 to build a railroad on the line. Nothing done on either.
Oswegatchie Navigation Co.	April 25, 1831	30,000	From the St. Lawrence to Black lake and Canton.	Nothing done.
Oswegatchie Navigation Co.	April 12, 1848	10,000		To improve Oswegatchie river and Black lake.

TABLE OF COMPANIES WHICH HAVE BEEN INCORPORATED FOR CONSTRUCTING CANALS AND EXTENDING NAVIGATION IN NEW YORK STATE—Concluded.

COMPANIES.	Date of incorporation.	Capital.	Connections.	Remarks.
Oswego Canal Co.....	April 23, 1822	\$10,000	Canal on east side of Oswego river, below Oswego falls.	After the company had expended from \$2,000 to \$4,000 for improvements, the State took possession of works to form part of Oswego canal.
Owasco and Erie Canal Co.....	May 1, 1829	150,000	Owasco lake and Erie canal.	Nothing done.
Peconic Navigation Co.....	Mar. 10, 1835	10,000	.....	To improve Peconic river at Riverhead. Never completed.
Peconic River Lock Navigation Co.	April 8, 1808	5,000	.....	To construct locks and dams in Peconic river. Nothing done.
Riverhead Canal and Mill Co....	April 17, 1864	10,000	Forge pond on Peconic river and Riverhead.	.....
Rochester Canal and R. R. Co....	Mar. 26, 1831	30,000	Rochester and Lake Ontario.	Railroad only constructed.
Salmon River Harbor Canal Co.	May 16, 1837	350,000	Lake Ontario and Port Ontario.	Never completed.
(Side canal).....	May 20, 1835	(No stock)	Susquehanna river at Brandywine creek to Chenango canal.	Individuals (not incorporated) authorized to construct canal and to charge triple tolls. Nothing done.
Scottsville Canal Co.....	April 30, 1829	15,000	Scottsville and Genesee river.	Built in 1837 and used for several years in carrying grain and flour from the southwestern part of Monroe county.
Seneca Lock Navigation Co.....	April 6, 1813	50,000	For improving navigation between Seneca and Cayuga lakes.	Improvements completed in 1821. State authorized to purchase company's rights in 1825.
Seneca and Susquehanna Lock Navigation Co.	Mar. 31, 1815	300,000	From Seneca lake to Chemung river at Elmira.	Nothing done.
Sodus Canal Co.....	Mar. 19, 1829	200,000	From Seneca river or Canandaigua outlet to Great Sodus Bay.	Partly constructed, but never used. \$100,000 expended. (See <i>Assembly Documents</i> , 1851, Nos. 64 and 65, for history.)
Sparkill Creek Canal Co.....	May 2, 1871	100,000	From Sparkill creek, at New York-New Jersey boundary line, through town of Orangetown, Rockland county, to the Hudson river.	.....
St. Lawrence Lock Co.....	April 1, 1808	.....	For building locks at Isle au Rapin.	Locks completed, but too small for general use.
Susquehanna and Chenango.	May 20, 1836	.....	Susquehanna river and Chenango canal.	.....
Tidal Waterway Co.....	May 19, 1894	5,000	.....	To construct canals in First Senate District. (Long Island.)
Wallabout Canal Co.....	April 9, 1828	20,000	Wallabout bay and Tillary street, Brooklyn.	Not constructed.
Wallabout Canal Co.....	April 18, 1838	25,000	Wallabout bay to Williamsburg (now part of B'klyn)	.....
Western Inland Lock Navigation Co.	Mar. 30, 1792	.....	To open navigation on the Mohawk, Wood creek, Oneida, Oswego and Seneca rivers to Lake Ontario and to Seneca lake.	Completed to Oneida lake in 1798, State having given much aid. Wood creek further improved in 1802. The grants west of Oneida lake were surrendered in 1808. The State purchased all remaining rights in 1820, and used a few available portions for the Erie canal.

CHAPTER XXIII.

THE ABANDONMENT OF THE LATERAL CANALS.

A history of the events and a study of the causes which led to the abandonment of the lateral canals.

The fact of the discontinuance of certain of the subordinate branches of the early canal system of New York has been given probably undue prominence in discussions of the economic possibilities of canal-building. Some have been inclined to condemn altogether the principle of internal navigation by canals, or at least the particular system to which these abandoned members belonged. Others have distinguished in favor of trunk lines, which tap some source of extensive through trade at their terminals, as against those which depend principally or entirely on the commerce originating along their courses. Familiarity with the history of canal-building in the state is necessary to a clear understanding of the special conditions which governed in this instance and which forbid too sweeping conclusions.

We have seen in previous chapters that while at first the canal project was pronounced impracticable, a mirage, an heroic dream, yet speedily following its material realization and success, its projectors were lionized and their ideas were exaggerated in a blind, popular frenzy over any improvement which outwardly bore a semblance to the Erie canal. Many men sought to share in the glory won by these pioneer statesmen, and many communities clamored for an extension of the branch lines to enable them to benefit more directly and to participate more freely in the splendid profit accruing to the State from its "Grand Canal." The records attest that petitions for canals poured in upon the Legislature from all quarters. The "great canal law" of 1825 (chapter 286) provided for the survey of some seventeen such waterways, aggregating in length many hundreds of miles. Even private enterprise—not to be deterred from enjoying its share in this glittering *El Dorado*, this "Broad and ample road whose

dust is gold"—secured charters and launched upon its particular schemes in blissful expectancy.

During this period the canal commissioners and advocates were wise enough to apply a good deal of deliberation, realizing that a misstep and failure in any particular meant a sudden and destructive reverse in the tide of public opinion. Even then there were dissenters to the wholesale extension of the internal waterways, who protested that the three or four main canals constituted a complete system in themselves.¹ As soon also as the railroads began to parallel the branching lines of canal, the rapid extension of commerce and the stimulating effect of the canals on business commenced to wane. Normal conditions were merely being resumed, but it seemed to the most ardent advocates like retrogression. From the height of enthusiasm some of them fell to the depths of disparagement over the canal-building issue. They intimated that rails and locomotives would do the work of artificial rivers and barges, and the State would be saved thereby the expense or risks involved. Sentiment even prior to 1835 swung to the extreme of proposing to convert the Erie canal into a railroad, and in that year the Assembly passed a resolution requesting the canal commissioners to submit a report² treating the subject of the relative advantages of canals and railroads, which should guide the Legislators in their consideration of the proposed expenditures for extension of the system and enlargement of the Erie. The weight of public opinion had not shifted, however, and with the commissioners' favorable conclusions the project to enlarge the Erie was carried. More laterals also were built or purchased, of which the last conspicuous example was the Black River canal, opened to navigation in 1850 or seventeen years subsequent to the completion of the Chemung and Crooked Lake canals—the first of the subordinate group afterwards abandoned.

¹Governor Tilden in his annual message of 1875 says: "It is a noteworthy fact that Mr. Flagg [Azariah C. Flagg, Comptroller, 1833-38 and 1842-47 and Secretary of State previously], who so long and honorably conducted the State finances when the Canal Department was a bureau in his office, always insisted that with the four canals now to be retained the system was complete." *Assembly Documents*, 1875, No. 2, p. 28.

The canal commissioners also in their report of 1830 declared that the Chenango canal, if built, would not prove self-sustaining. *Legislative Documents*, 1830, No. 47, p. 26. See also *Senate Documents*, 1831, No. 32.

²*Assembly Documents*, 1835, No. 206.

As the expense of maintenance on the minor lines of the system rose year by year, it became increasingly embarrassing to make the extensive repairs and renewals. Year by year also these canals, which had never been self-supporting, were forced to surrender more of their revenues to the competing lines of railroad, until, led to take advantage of the elastic term "Ordinary Repairs" to make good the deficiency on their balance sheets, the commissioners not only brought upon themselves the accusation of spending the surplus tolls earned by the trunk canals, which by the Constitution should have been contributed towards the several sinking funds, but for current work on the laterals they were known to have drawn heavily also upon that portion of these moneys specifically assigned by the Constitution to the enlargement of the Erie and the completion of unfinished work. Obviously, the speedy fruits of such a device were delays and shortcomings in the constructive work already authorized, recommendations from the commissioners for further appropriations far in excess of the original estimates, and to these frequent appeals a more and more irritable response.

In February, 1850, the Senate, rased by such irregularities of procedure, passed a resolution bidding the commissioners to report all recently adopted plans for improving or renewing locks on any State canal except the Erie, together with a statement of the authority under which they operated and the fund provided for the execution thereof. A dissonant voice responded in the minority report presented by one of the three members of the commission who hinted at extravagant expenditures and charged that the term "*ordinary repairs* . . . by a little legislative legerdemain," had been "made to signify the enlargement of the lateral canals, and embellishing them with costly and magnificent bays, basins, and aqueducts—the constructing of new canals where none have heretofore existed—the changing of the routes of the old lateral canals, and in short, the entire engulfing, in the lateral canals, the *remainder*, which the people, in adopting the Constitution, vainly supposed they had sacredly pledged to the completion of the works which had been authorized by law, begun, and abandoned for want of funds."³

³Minority report of Frederick Follet, canal commissioner. Submitted to Senate March 21, 1850. *Senate Documents*, 1850, No. 88.

The commissioner continues, voicing, for the first time officially, the attitude which culminated in the legislative abandonment of 1877: "It [the Erie canal] is the aorta of the canal system, bearing the life blood of commerce from its most distant ramifications . . . and it can ill afford the gross robbery of the aliment upon which it had a constitutional right to depend."

The public was considerably stirred by the evident costliness of canal work, over and above the estimates, upon which as a basis it was undertaken; and the Governor in his annual message of the ensuing year, 1851, dwelt at length upon the problems of financing the projects for enlargement and completion in such a manner as to expedite that preeminently important matter to a greater extent than the specific terms of the Constitution would allow.

Passing over the succession of acts, measures of relief, repeals and constitutional amendments, whereby the greater canal came to be, in 1862, an accomplished fact, one is more and more impressed with the transition of public feeling from its ecstasy of support of the principle of artificial waterways, even in cases of doubtful promise, to an acutely sensitive state of mind with reference to any further expenditure or application of the principle however conservative. By 1867 the attitude of the people was reflected in the Legislature through the appointment of a joint committee to examine into the management of canal affairs, and the sentiment of distrust came to a head in the further appointment, in 1875, of another joint committee of the Legislature, charged "to investigate . . . the question of fraud and collusion," with reference to the administration of canal funds, and to report within thirty days.

Prior to this, however, in the year 1873, a Constitutional Convention proposed, together with numerous other amendments, one which was notable as anticipating the future canal policy of the State. Section 6 of article 7 of the Constitution of 1846 provided that, "The Legislature shall not sell, lease or otherwise dispose of any of the canals of the State; but they shall remain the property of the State and under its management, forever." What the convention now proposed was to amend this section so as to read, "The Legislature shall not sell, lease or otherwise dispose of the Erie canal, the Oswego canal, the Champlain canal, or the Cayuga

and Seneca canal; but they shall remain the property of the State and under its management forever.”⁴ The proposed amendment further restricted the entire expenditures in behalf of the above-named canals for any one year to the amount of “their gross receipts for the previous year.” It also provided that the sums accruing from the disposition of any canal should be applied towards the “payment of the debt for which the canal revenues are pledged.” And in section 13 of the same article, it was proposed by amendment to forbid the appropriation of the several sinking funds for any use except payment of interest and extinguishment of principal of the public debt and of that particular debt and in the specific manner prescribed.

It is noteworthy that when the resolution of the Senate, which embraced these propositions, was put before the Assembly, the latter body rejected motions which arose successively to include in the reservation the Genesee Valley and the Chenango canals, but inserted, by an amendment passed with a narrow margin, the words, “the Black River canal,” thus reserving five instead of four members of the system. The resolution thus amended passed the Assembly by a significant vote, in the approximate ratio of one to seven. The Senate, however, refused to concur in the amended resolution. It was returned, and again referred to the Senate, thence back to the Assembly, which finally agreed to recede from its amendment, and thus to withdraw constitutional protection from the Black River canal, as from the several other laterals.⁵

By the ratification of the Legislature of the following year, 1874, these proposed amendments, in conjunction with many others, were brought to the test of a popular referendum. The results of this direct vote, by the people of the State, on legislation in which the issue between retention and abandonment was so clearly marked, must be very instructive, it would seem, as an index of the popular attitude, and of the local feeling as well, in regard to the several smaller canals of the system. The amendment was carried by a popular vote in the ratio of four to one.⁶ The smaller majorities were polled in the counties bordering the

⁴See *Laws of 1874*, Concurrent Resolutions, p. 931, and *Revised Statutes*, Eighth Edition.

⁵*Assembly Journal*, 1873, pp. 1956-7, 2192, 2271-2.

⁶*Assembly Documents*, 1875, No. 15, p. 15.

canals most affected, although no county in the state, with the exception of Schoharie, Yates, Jefferson, Lewis and Oneida, voted against the amendment, and only the last four of these contained portions of the canals, while the last three, polling the heaviest majorities in opposition, lay along the Black River canal and their strong sentiment in favor of the preservation of that waterway was evidently reflected in the vote they cast. Oneida county, which was also very reluctant to have the Chenango canal abandoned and its empty prism left to breed miasma through the City of Utica and near the junction with the Erie canal, expressed decidedly the strongest opposition to the passage of the amendment.

The secret of such unanimity of feeling, aside from the general reversion of the public from an ultra-favorable to an extremely unfavorable disposition towards the canals, may be deduced first, from the fact that the laterals under consideration had never been self-supporting, and gave less and less evidence of becoming so; and secondly, because it was so obvious, as a glance at the auditor's tables of annual movements on the State canals would show, that the internal traffic had been generally diminishing, or at best holding its own, while the bulk of foreign commerce passing through the trunk lines had increased amazingly and become the mainstay of those canals.

The tonnage of forest products passing on the canals from other states to tide-water had, for example, increased rapidly, while the increase of the local shipments was only noticeable up to about 1855, from which year it had fallen gradually to a vestige of its former proportions.⁷ The improvement of the output of agricultural products from out of the state was less marked in the later years, although they attained a greater magnitude than the products of the forest and held to it with considerable uniformity. The internal output via the canal had, on the other hand, fallen more or less regularly and had become a mere fraction of its initial amount.

These two classes of products constituted the bulk of shipments on the canals, and thus, although the same law of change is not observable in relation to the shipments of manufactures

⁷Annual Report of Auditor of the Canal Department, *Assembly Documents*, 1877, No. 31, Statement No. 30.

and merchandise, the figures for total movements on the canal show the amount of domestic traffic to be about the same in 1877 as in the early days of 1835 or 1840, while the proportion of tonnage, entering from and destined to points without the state, had risen from about twelve to some ninety per cent of the total shipments on the Erie, to and from tide-water. While such figures do not take account of the local traffic from point to point on the canal itself, still it may readily be conceived that, because of the evident failure of the lateral canals to pay their way, the people laid hold of them as the first victims of their disaffection and growing economical tendencies.

In consequence of the new amendment to the Constitution, already noted, the way was prepared for radical action when, by the early part of the year 1875, remonstrances against the heavy draught on the public purse in behalf of canals had taken shape in the appointment of the joint investigating committee aforementioned. In his annual message of January of that year the Governor reviewed at some length the subject of canals, and declared that some relief must come whereby the accumulating expenses could be defrayed or curtailed. He then differentiated between the trunk and lateral canals, stating that the maintenance of the latter had in the three years, 1872, 1873 and 1874, not only consumed the entire surplus tolls of the prosperous members of the system, but had in addition burdened the State with an average yearly deficiency of some \$77,000, so that, instead of an annual sinking fund set aside for the purpose of canceling the public indebtedness on account of canals, it had now become necessary to levy taxes upon the people year by year to meet the requirements of extraordinary repairs. As the revenues, with past revisions of the toll sheets, were materially diminishing, while shippers importunately maintained that they could not compete with other transporting agencies unless rates were still further reduced, the Governor proposed to take advantage of the recent amendment to the Constitution and, confident that no private enterprise would undertake their operation, he in substance urged the abandonment of the non-paying canals.

Perhaps the gubernatorial attitude with reference to this matter was in a measure a concession to the outburst of popular

prejudice against canals in general. It was the canal budget which had become so grievously onerous in the public estimation. It was the canal revenues at large which were diminishing. And these and all imperfections were swept along without distinction in the tide of public sentiment against the very principle of canals and all that related to them. The Governor may have deemed it necessary to surrender the laterals in order to save the main canals, allowing such action as a safety-valve for popular sentiment. It is significant that the same document calls to mind the glorious record of the Erie canal, and asserts that it still possesses latent possibilities of development and its retention is still of vital importance to the interests of the State of New York.

In his so-called "inflammatory" special canal message of March of this same year, 1875, the Governor pursued the thread of his former discourse, but confined himself largely to the matter of frauds in official circles, and urged the cessation of all extraordinary repairs (unless absolutely necessary) until after thorough investigation. Responding to this and the annual message, the Legislature promptly passed resolutions, one of which required the canal commissioners and the State Engineer and Surveyor "to examine the Crooked Lake canal, the Chemung canal, the Genesee Valley canal, the Chenango canal and the Black River canal, and their appurtenances to take such testimony in respect to the same as they shall deem necessary or expedient; . . . to report . . . on all matters incident to such disposal of the canals as may to them seem expedient,"⁸ and finally to submit their report to the Legislature of 1876.

Then followed a year during which the public was stirred to a very intense state of agitation by purported revelations of mismanagement. Then, too, a committee of the canal board on tolls reported that, in order to compete with the railroads and the Welland canal, the tolls on the State canals must be reduced, and they advised that this could be aided by reserving to the Erie that portion of its revenues which had gone heretofore towards the maintenance of the laterals.⁹

⁸*Laws of 1875*, chapter 499.

⁹*Assembly Documents*, 1875, No. 103.

Also, in 1876, the message from the Executive adverted again to the advisability of abandonment, as one of six "future measures" designed to relieve or correct existing delinquencies.

In the spring of 1876, notwithstanding the decease of one of the canal commissioners late in the year previous, which prevented the collective report and opinion requested by the legislative resolution of the preceding year, and notwithstanding the fact that no testimony had been taken as contemplated in that resolution, communications and partial reports from the two surviving members were submitted to the Legislature. These were along conventional lines and recommended, the one a continuance of the Black River canal but the abandonment of the laterals generally, and the other the completion of work and resumption of business on the Oneida Lake canal, and the lease or sale to some navigation company of the Genesee Valley canal, or, at all events, a delay of several years before its abandonment.

The report, thus incomplete and inconclusive, lent force to the original suggestion of the Governor that a special commission of experts should be assigned to the task of conducting a thorough investigation, and accordingly, during the session of 1876, an act¹⁰ in more definite terms was passed, appointing as commissioners, A. B. Waldo, Warner Miller, E. W. Chamberlain and William Foster, who were charged "to visit, inspect and examine the lateral canals, known as the Chemung canal and feeder, the Crooked Lake canal, the Genesee Valley canal, the Chenango canal, and the Black River canal, and each of them and their appurtenances, in order to ascertain:

"1. The condition of each canal—its direct revenue—and its contribution to the system,—the cost of maintaining it and keeping it in use, and probable future outlays for repairs and replacement if it should be kept in permanent use.

"2. Its value for hydraulic and commercial purposes and its usefulness to the business interests of its vicinity.

"3. Its necessity or utility as a feeder to the Erie canal, to what extent it is needful for that purpose, and the annual cost of keeping it in use as a feeder and only for that purpose.

"4. What means, if any, will be necessary to prevent injury or damage from any canal kept as a feeder or abandoned or

¹⁰Laws of 1876, chapter 382.

the reservoirs connected therewith, to adjacent or neighboring property.

"5. What portion of any canal to be disused, or any property connected therewith, can be sold and for what probable sums.

"6. Generally what disposition should be made of such canals; and to report to the Legislature of 1877 . . . all facts . . . together with their opinion as to whether said lateral canals, or any of them, or any portion of either of them shall remain under the control and management of the State, or be sold, leased or abandoned."

Certain further charges were imposed upon the commissioners, particularly in the way of ascertaining the number and importance of concerns dependent on those canals and the extent of such dependence. In addition the commission was empowered to subpoena and take evidence and convene wherever deemed necessary to prosecute their investigation.

A bill was presented during the same session of the Legislature, entitled "An Act to provide for the disposition of the lateral canals,"¹¹ but it was superseded by the act appointing the special commission. Further insight, however, into the indiscriminate peevishness of the public mind, with respect to the whole system of canals, and likewise of the line of argument pursued by the Legislators in their distinction between the trunk lines and lateral ramifications, may be had from an excerpt taken from a report in behalf of the House committee on canals for the year 1876, in the following language:

"Your committee desire to counteract a false impression which they apprehend is sought to be made by interested parties as to the real value of the Erie, Champlain, and the Oswego canals to the treasury of the State.

"They are aware that an impression is being made throughout the State to the effect that the canals are a tax upon the State, and that the Erie, Champlain and Oswego canals are not exempt from this charge. Whereas they respectfully call the attention of the House to the report of the Auditor of the Canal Department for 1875, and particularly to statement "E" thereof, on page 150, wherein it is shown that the revenues of the Erie, Champlain and Oswego canals, after deducting all costs for con-

¹¹*Assembly Journal*, 1875, p. 556.

struction, repairs and maintenance, with interest thereon at six per cent., is over \$63,000,000; and clearly showing that instead of being a tax upon the people they have been a source of great revenue.

"Your committee call the attention of the House to the further fact that out of a total tonnage of 3,223,112 tons arriving at tide water during the year 1874—a year of great commercial depression—over the Erie, Champlain and Oswego canals, 2,400,127 tons were from the western States, Canada and Vermont.

"Your committee are not prepared to admit that the waterways connecting the Lakes Erie and Champlain with the Hudson river, are to be abandoned for want of honest and capable men to manage them."¹²

From the foregoing it is easy to conjecture how well assured was the fate of the subordinate members of the system at the hands of the people. It remained only to act with becoming deliberation, to protect the trunk lines from the ravages of popular disaffection, and to ascertain beforehand the precise limits to which the policy of retrenchment should extend.

In January of 1877 there was transmitted to the Legislature the report of the special investigating commission on abandonment of the laterals.¹³ The commissioners presented not only the results of a comprehensive study of the physical condition of these canals and their financial possibilities, but also, by a minute examination of isolated and individual interests, they had established the facts relative to their public utility and the probable difficulty and expense of abandonment. The report contained the testimony of forty-six persons, was taken in the course of twelve or more sittings in as many towns and cities situated along the several canals under consideration, and was supplemented by numerous exhibits of private interests and of clearances, disbursements and statements of equipment and property. The following table compiled from data furnished by this commission illustrates forcibly the increasing inability of the canals in question to sustain themselves:

¹²*Assembly Journal*, 1876, pp. 337-338.

¹³*Assembly Documents*, 1877, No. 30.

NAMES OF CANALS.

YEAR.	CHEMUNG.		CROOKED LAKE.		CHENANGO.		GENESSEE VALLEY.	
	Annual loss.	Revenue in percentage of expenditures.	Annual loss.	Revenue in percentage of expenditures.	Annual loss.	Revenue in percentage of expenditures.	Annual loss.	Revenue in percentage of expenditures.
1865.....	\$85,508	32.8	\$37,464	13.4	\$117,314	15.8	\$238,074	9.9
1866.....	40,300	55.0	3,514	72.4	150,740	28.6	78,803	29.7
1867.....	91,805	31.8	3,752	54.8	155,724	18.9	74,285	31.8
1868.....	44,002	39.8	27,439	9.1	124,121	16.6	67,976	37.1
1869.....	55,078	30.7	45,592	11.1	124,112	34.6	103,134	23.6
1870.....	107,878	17.6	5,582	34.5	116,194	16.2	313,593	8.6
1871.....	153,501	17.7	74,584	5.1	106,134	3.2	311,063	7.2
1872.....	45,633	8.0	11,592	12.2	185,453	3.2	205,160	10.5
1873.....	45,101	13.3	11,592	16.7	183,436	2.2	205,823	23.8
1874.....	40,707	10.5	7.3	7.3	73,446	6.7	93,574	16.6
1875.....	26,237	9.0	11,842	*	29,313	10.0	96,054	12.2
1876.....	6,782	69.1	*	*	5,223	37.2	8,179	65.0

Figures deduced from Tables 1 to 4, of report on abandonment of the laterals. "Revenue" = Sum of tolls proper and tolls contributed to the Erie. "Expenditures" = Sum of superintendence, ordinary and extraordinary repairs. "Loss" = Difference of above sums.

Note:—During the later years of this period the expenditures for repairs were largely curtailed in anticipation of the abandonment of these canals. This fact accounts for the apparently favorable ratio of income to expense after about the year 1871.

* Figures not ascertainable.

The commissioners reported the total difference between running expenses plus cost of construction, and the revenues up to the year 1876, to be, in round numbers, for the Chemung canal, three million dollars, for the Crooked Lake, eight hundred thousand, for the Chenango, six million, for the Genesee Valley, eight and one-half million and for the Black River, five million dollars. These figures represented, therefore, the total loss to the State, aside from damages and interest on loans and exclusive of the valuation of marketable property.

Having treated each of the canals separately in previous chapters, it is not necessary to discuss in detail the findings of the board. In general it may be said that they ascertained with reference to four of these canals (excepting the Black River canal) that several sections had already fallen into disuse; that extensive repairs would generally be needed in a brief time, the traffic having diminished, partly on account of the inferior facilities provided; that the legitimate claims of manufacturers against the State for hydraulic privileges on these canals were inconsiderable; that, with the exception of the summit level of the Chenango canal, which they proposed to retain for the Erie canal, and ultimately the Hudson river water-supply, would not be at all impaired by abandonment; that the means necessary to prevent injury on leaving the waterway exposed to natural forces would not entail unusual expenditures; and that ample and superior transportation facilities had already, for the most part, superseded these canals. The commissioners doubted the possibility, as a business proposition, of selling the canals and the appurtenances intact, especially from the difficulty of exacting from any operating company a suitable guarantee of its future conduct; but as a legal question, they adjudged that the State was owner in fee simple, and, though once bound by a provision of the early Constitution to a permanent occupation, was yet relieved from all claims arising from that provision by the amendment of 1874, passed in conformity with the inherent right of a people to amend its constitutional law. In consideration of these leading facts, and from the further circumstances, that they were unable to discern any prospect of sufficient future development of the resources of the tributary country on which these four canals would depend, they declared in favor of abandonment.

On the other hand, investigation of the Black River canal disclosed the following circumstances favorable to its retention :

No extraordinary repairs were needed at once.

The canal was believed to be self-sustaining, if tolls contributed to the Erie were to be charged in its favor, and if expenses charged against it as a feeder of the Erie were to be transferred to the latter.

The lumbering interests had grown up at its instigation, were thriving and gave prospect of increasing immensely in future, but would be strangled without the canal, since rates by rail were prohibitive and railroad routes were not convenient.

Perhaps most influential of all considerations,—the water-supply to the Erie canal from the Black river and its reservoirs was essential to the former, and to conduct it by another channel would mean a heavy outlay.

The commissioners thus rendered their opinion in concluding: "In the first instance," they asserted, referring to the southern laterals, "the business of the canal is gone or is fast disappearing, and its necessity no longer exists; in the latter," they continued signifying the Black River canal, "the business is to grow and multiply and the canal to become more and more useful to the people." The prevalent sentiment and the extent to which the popular cry of "Down with the Canals" interfered even with impartial treatment of the subject, is again indicated in the sentence, "Allowing due weight to these considerations and recognizing the spirit of economy and the desire for retrenchment which pervade the people, your commissioners submit their recommendations to the judgment of the Legislature."

Licensed by the logic of this excellent and exhaustive report the Legislators were now prepared to give way to that "desire for retrenchment" which possessed the people and yet it was a testimonial to the merits of the investigation that a statute enacted in June of the same year, 1877, followed closely the recommendations of the commissioners.

In years previous to the adoption of the constitutional amendment there had been some relinquishment of lands owned by the State in connection with the canals, and an act¹⁴ had been passed providing that, when the canal commissioners decided that lands

¹⁴*Laws of 1857*, chapter 267.

appropriated for State canals had been abandoned, they might sell the same or might, if such lands had been originally granted to the State without a consideration, release the title to former owners, excepting sections valuable for hydraulic purposes which were not to be conveyed *in perpetuo*. A later statute¹⁵ declared that this act applied to lands owned by the State at the time of their appropriation for canal purposes. The session of 1877 used this old law as a nucleus¹⁶ and built about it the legislation already indicated, which finally abolished the several canals specified, and which, in view of its bearing on the subject under consideration, we shall examine at some length.

The statute¹⁷ passed in 1877 provided for the disposition and sale of certain lateral canals and the lands, rights and other property connected therewith in the following manner:

1st. A portion of the Chenango canal, "commencing at and lying south of . . . the village of Hamilton, Madison Co.," after May 1, 1878, and excepting certain reservoirs and feeders (needed for the Erie canal), and reserving the water-supply for the State Lunatic Asylum which was to be maintained by the canal authorities.

2nd. The Chemung canal at the close of navigation in 1878, the water-power and rights on the Chemung river to revert to the former owners or their successors.

3rd. The Crooked Lake canal, on and after the passage of this act, the State to restore or secure permanently the natural flow and hydraulic action of the lake.

4th. The Genesee Valley canal, on and after September 13, 1878.

By the terms of this act the commissioners or the Superintendent of Public Works were to appraise the portion of these canals lying in the several villages for both land and water-privileges, and give the option of purchase to these villages; and the same option was to hold for inlets or outlets or portions desired for hydraulic, hygienic or fire purposes. The villages

¹⁵*Laws of 1869*, chapter 361.

¹⁶See Section 7 of *Statute of Abandonment*.

¹⁷*Laws of 1877*, chapter 404. Amendments: *Laws of 1878*, chapter 344; *Laws of 1879*, chapter 522; *Laws of 1881*, chapter 157. See also *Laws of 1881*, chapter 288.

were required to pay one-fourth of the price down and the rest in six equal annual installments with interest at six per cent. A certificate of purchase was to be given at once in such cases, but no deed until the end of the period, while in event of failure to pay when due, the property and previous payments should revert to the State.

Owners of adjoining estates, from whose lands the canal was originally taken by grant and without payment, were to be given an option on the abandoned territory which had been taken at that time from their holdings. The terms of payment in such cases were prescribed in the act and amendments.

The materials of locks, bridges and other appurtenances, with certain exceptions, were to be sold at auction unless it was deemed to be for the public interest to retain them or dispose of them otherwise.

Through farming lands the canal was to be conveyed in full width where the grantees owned the adjacent property on both sides, or the division was to be made along the center line of the prism where conveyed to different parties owning on opposite sides, and these grantees were to release the State from obligation to maintain bridges and from liability for damage. It also devolved upon the commissioners or superintendent, by the requirements of this statute, to restore streams which had been diverted from their old channels and to secure the abandoned prisms against the flow of water, except, in all cases, where the canal was to be retained, or used as a feeder or for hydraulic purposes.

With sufficient guarantees, the commissioners or superintendent, acting with consent of the canal board, were empowered to dispose of abandoned sections to responsible parties for railroad or canal purposes.

The net proceeds arising from this disposal were to be contributed as a sinking fund to redeem the canal debt. And finally no person or corporation was to have any claim against the State by reason of this proposed abandonment.

The passage of this act substantially closed the official history of the four canals named, and in its effect definitely settled the question of reopening the Oneida Lake canal as well. Whether the fate of lateral ramifications to the great Erie system of the

State has been sealed for all time thereby we cannot know. There remained the actual execution of the law, and its several amendments, none of which altered materially the sense of the original document. The occasional statutory conveyances to villages lying on the banks of the abandoned waterways, or to abutting land owners, and the transfer now and then, of a short stretch for some railroad location, or claims against the State through a menace to health, brought about by the evacuation of the canal property, although measures of some passing interest, need not occupy our critical attention. The returns from sales of canal rights and property have been, until recently, merged in the general fund, so that no statements are available. It is safe to say, however, that the amounts accruing have been very meagre and insignificant in comparison with the sums which were previously expended in construction and repairs, so that the data accumulated by the commissioners of 1876 and 1877 and already quoted, express substantially the final and unfavorable balance of profit and loss to the State on account of these several laterals.

On November 7, 1882, the people of the State of New York ratified an amendment to section 6 of article 7 of the Constitution which reinstated the Black River canal in the list of those exempt from sale or disposition at the hands of the Legislature. By amendment proposed by the Constitutional Convention of 1894, permission was granted to sell a short section of canal connected with the Erie in the City of Buffalo. The section of the Chenango canal north of Hamilton, reserved by the law of 1877, has since been abandoned also. Otherwise, the status of the system remains to-day as it was left by the legislation of 1877. It may be said, however, that in his annual report of 1900, the Superintendent of Public Works recommended the abandonment of section 2, of the Black River canal, by reason of its diminutive business interests and that the Governor in a subsequent message approved the recommendation.

While another chapter has been devoted to a discussion of the canals undertaken and administered by private interest, it may be briefly noted here that they too have all disappeared, leaving the five lines specified in the Constitution as the sole survivors and representatives of the era of canal-building in this state (the Baldwinsville, Seneca river and Oneida river branches being really parts of the Oswego canal).

The circumstances of the abandonment of these and other contemporaneous canals, here and elsewhere, has been, as we have already stated, a chief stumbling-block in the subsequent advocacy of artificial inland waterways in general. The claim is made, however,—and it appears to be substantiated—that this policy of retrenchment did not extend to the vital members of the system, nor vitiate the principles of canal-building. It was simply like a thinning out of the overgrowth, a pruning of the rank or adventitious parts, or better still, the dead branches which had once borne fruit. Such a process does not imply that there can be no vigorous limbs nor that there is necessarily decay in the great parent stem; nor because we have so much use for the pruning knife in arboriculture do we lose courage and cease planting more trees.

We have likened the abandoned laterals to an adventitious overgrowth, and to a large extent this is consistent. The ready flow of population and the public money westward in conjunction with the opening of the Erie, the well authenticated mania for canal-building that followed, evinced, for example, by the very numerous petitions for canals other than those actually built, are facts which would of themselves lead to the presumption that the canal principle was overexploited. The special commissioners of 1876 and 1877 attempted to “ascertain the reason which induced the State in each case to construct these canals . . . the public or private interests supposed to be subserved.” Apparently they discovered that, in a general way, the promoters of the old Erie, which was to be the trunk of the system, voiced the expectation of the people with respect to the entire system. To be sure the most sanguine prophet could not have anticipated that the inland laterals would exercise any appreciable influence in cementing together the different parts of the Union—the East and the West, nor that they could intercept and transmit to New York, as to a great distributing center, goods which would otherwise pass through the Welland canal and down the St. Lawrence, even though many declared these to be the chief functions of the canals of the State. Nevertheless, like De Witt Clinton, in earlier times, men predicted that “the enhancement of the profits of agriculture; the excitement of manufacturing industry; the activity of internal trade; the benefits of lucrative traffic; the

interchange of valuable commodities; the commerce of fertile, remote and wide-spread regions . . . [would] spread the blessings of plenty and opulence to an immeasurable extent."¹⁸

They fancied that wherever the arms of the great Erie should extend, there too, "The wilderness and the solitary place shall become glad . . . and the desert shall rejoice and blossom as the rose."¹⁹ It is a simple matter of observation that such a glowing prophecy was not fulfilled with respect to the laterals and no one will presume to claim the contrary.

On the other hand it is to be remembered that the extreme disaffection toward the canals into which the public mind had come at this time was almost as unreasoning as the former state of frenzy on the subject, and that, with or without excuse, the hand of the Legislature was virtually forced by public opinion, especially in its effort to neutralize this destructive tendency before it extended to the Erie and trunk lines. It is worth while questioning therefore whether these deceased limbs of the great system were absolute failures or did have a period of fruition.

There is little, indeed, to be said of the direct benefits derived at any period of their existence. The fact is not to be disguised in the first place that, as above detailed, there never was a time when the revenues from these canals amounted to as much as the cost of maintaining them. The laterals were not built early enough to attain a basis of self-support before the era of railroad competition began, for the first of them was not opened until 1833 and the Erie railroad was then already chartered. The effects were not so heavily felt as to prevent a yearly increase of activities, however, as we have seen, until 1850 or 1855, from which time the business and returns of these canals hopelessly waned. They were a continual drain on the finances of the system, and the deficit was unmistakably increased year by year.

Aside from immediate and obvious financial considerations the question arises, however, as to whether these waterways had benefited or were benefiting the several communities enough to pay

¹⁸Speech of De Witt Clinton to Legislature, January 27, 1818. See *Assembly Journal*, 1818, p. 9.

¹⁹Quoted in the memorial presented by New York City to the Legislature of 1816, which was very influential in accomplishing the passage of a law, the precursor of the Erie canal construction law of the following year. *Canal Laws*, Vol. I., p. 129.

for their retention. The studies made in connection with another chapter of this work indicate that the population of the southern counties situated on lateral canals increased with marked regularity from 1810 until about 1830, but that during the decade from 1830 to 1840 a decline in the rate of increase took place, which not only determined the average rate for the next five years but also that for the ensuing sixty years, from 1840 to 1900. Thus the counties bordering lateral canals lost rather than gained in their rapidity of growth during the early years of operation of these canals. As a matter of some interest in this connection, census returns for 1835 from nine canal towns—four on the Chenango and five on the Genesee Valley canal—were compared with similar returns for the year 1845. It appears as a result of the comparison that for the nine towns there was during the decade a slight net decrease in the rural population and also in the value of manufactured articles; there was, with one exception, a sensible increase in the amount of improved land reported for the several towns. At least two villages included were located also on the line of the Erie railroad. The decrease, it may be said, was more marked along the Chenango than the Genesee Valley canal.

The evidence before the special commission on abandonment abounds with references to such industries as were represented by lime-kilns and plaster-mills employing three or four men the year around; but there is a dearth of considerable business interests which would be sure to step forward and make themselves known if they existed. As the commissioners stated, if the evidence was meagre, it was because of the meagreness of the subject, which they believed they had exhausted.

But certain interested parties, who acknowledged in their testimony before the commission, that little of the shipping was actually done by canal, most of the coal even being obtained by rail, still maintained that water navigation as an alternative was necessary to keep down the railroad rates. No doubt the statement was correct that the canals had a rate-regulating potency, but with the limited interests involved, this alone did not justify retention nor did the ultimate abandonment operate to destroy the producers.

It is thus the verdict of research in that direction that these laterals did not at any time extensively develop the regions which they traversed. They did not materially enhance the profits of agriculture nor excite manufacturing industry nor "spread the blessings of plenty and opulence." The need of improved transportation facilities which they were intended to satisfy was in large measure supplied by the railroads, and so meritoriously that those particular canals were no longer required for the public exigency. The early promoters could not foresee the influence and competition of the railroads. Thus while the light of history would not justify the price, it might exonerate the spenders; but in view of the steadily diminishing usefulness of the lateral canals it could not justify their continuance under the economic conditions which then obtained. The commission very pertinently epitomized the situation in its concluding words, namely: "Whatever was their force originally, . . . the interests to be subserved by the canals have, in some cases, largely ceased to exist or are otherwise better cared for; and the contribution to a permanent and general system so confidently expected has been a failure from the first and, in unmistakable instances, is decreasing in amount year by year."

In the application of this conclusion to general principles of canal-building, however, we may be permitted to remark that, from the standpoint of the engineer, there were certain disadvantages attaching to these and to similar canals throughout the country which have been abandoned, and that these disadvantages by no means appertain to all canals nor even to all tributary canals. In the first place, it is to be noted that while the locks on the Erie averaged about one in every five miles, the Champlain, one in three, and the Oswego, one in every two miles, locks on the smaller laterals were as frequent as one per mile, two per mile or even exceeded three per mile in some cases, thus implying unfavorable topography for the latter, and a very material addition to the expense and difficulty of construction, operation and maintenance. Moreover, the wasteful, intermittent process of construction of the laterals was a conspicuous factor contributing to their downfall, a factor which might have been averted by more extended and careful preliminary estimates, reinforced by such a fund of experience as we possess to-day, in conjunction with a

more businesslike and consistent legislative policy. Not a little of the difficulty experienced in securing suitable materials for lock construction—their excessive cost and the opportunities for poor workmanship in the case of stone masonry and the necessity for continual repairing and rebuilding of wooden or composite structures, so noticeable in the history of the abandoned canals—may nowadays to a very considerable extent be obviated by the use of the new material—concrete.

Again, it is a fact that these laterals had not the advantage of being branches of the trunk line in the sense that the auxiliary lines of a railroad are branches of its main thoroughfare and tap the outlying districts. The heaviest freight-car which travels on the main line of the railroad can usually be shifted off on to a branch and continue to its destination; but the full capacity canal barge for the large prism must transfer its goods to a smaller boat, adapted to the navigation of the lateral, or else the smaller boat must ply the large canal to obviate reshipment of its cargo, either alternative greatly increasing the cost of transportation of local freight—on which the laterals depend—relatively to through freight, and, therefore, greatly diminishing the serviceability of lateral canals of different prism from the trunk lines.

That the largest unit quantity of shipment, other things being equal, means the maximum economy of transportation, is, we believe, the secret of the inherent advantages of transportation by water. That there is, further, a saving in the case of water carriage, when an increased bulk is conveyed in a single bottom, may be easily demonstrated; for the fact is apparent that a mere increase in size of craft involves far less than a corresponding increase of immersed surface, whence the horse-power necessary for propulsion, being directly proportional, theoretically, to the area of immersed surface, is much less per ton of cargo in the case of the larger vessel. Moreover, if a canal be deepened and widened, the maximum boatload or weight of cargo which it will float increases about as the cube of the depth, while the cost of construction increases less rapidly than the square of the depth, and the cost of maintenance probably in a less proportion still. As no such course of reasoning is applicable to the economics of

land transportation, it is clear that the advantages of the enlarged canal prism are very great.

It should be borne in mind, however, that without enough traffic to keep the large canal busy, the additional outlay for constructing and maintaining the same is not warranted. Thus in the case of the laterals, if built before the day of railroads, they might have proved worth while, even with a small prism like the original Erie and notwithstanding other disadvantages. They would have furnished the cheapest mode of transportation available, despite high tolls; but when the railroad entered the field, it was impossible to operate them with sufficient economy to compete. If the business interests had been ample enough to admit of the enlargement of the prism, if the laterals had been the outlet of a congested district, or perchance if the agriculture of the interior of the state, upon which they depended so largely, had not already begun to feel the withering effect of western competition, then there is no good reason to suppose that these canals would not have held their own—as in the case of the trunk lines—against the innovations of the railroads. The productivity of their tributary areas (so it was deemed) did not permit this course of action and they were, therefore, ultimately killed by the more economical transporting power.

In conclusion, it is fitting to emphasize the fact that the canals were abandoned, not because of the failure or fallacy of the canal principle, but rather from misapplication of it. Obviously there was a distinct difference between the laterals abandoned and the canals retained. The latter were through channels, and by way of them the great West and other regions poured their products to the seaboard at New York City, while they handled as subsidiary the local traffic, the class on which the laterals were forced to depend altogether. Through this combination the trunk lines were able to attain an economy of transportation far superior to that reached by the lateral branches; so that, while the Erie and Champlain and Oswego endure and flourish to the present day, the Chemung and Chenango and Genesee Valley canals have been obliterated by competing forces.

CHAPTER XXIV.

THE CANALS AS A SCHOOL OF ENGINEERING.

The New York canals, the great pioneer work of engineering in America—the first American school of engineering. “From this school arose nearly all the canal engineers who have lined the map of the country with their works of internal improvements.” (D. S. Gregory, writing in 1866.)

It is well to pause a moment and consider another feature of the canals, a feature which exerted a tremendous influence toward the subsequent development and progress of the country—the New York canals as the first American school of engineering—this great pioneer work of American engineering, where the engineers, without previous training, learned in the hard school of experience, and conquering by courage, persistence and force of character, became famous in their profession and spent lives of usefulness in their country's welfare.

In his address as President before the American Society of Civil Engineers,¹ Mr. Desmond FitzGerald divides the history of engineering in America into four periods. The first was from 1785 to 1810, the second, from 1810 to 1830, the third, from 1830 to 1848, and the fourth, from 1848 to the present. The first was a period of canal agitation and experiment, the second, a period of canal-building, the third, of railroad-building, and the fourth, the period of modern engineering. Using this same classification of periods in our study of the present subject, we see that, with scarcely an exception, can there be said to have been any American engineers until the beginning of the Erie canal in the second period. During the first period many schemes for canals were proposed but only a few of them were consummated. In Virginia the James and Kanawha rivers were connected by a short canal, and two short canals were built around falls in the Connecticut river. The first engineering proposition of any magni-

¹*Transactions of the American Society of Civil Engineers*, Vol. XLI., p. 597. Address delivered June 27, 1899.

tude was that of connecting the Chesapeake bay with the Ohio river. But most of the improvements of this period were confined to rivers. The Santee canal, the first true canal in the country, was twenty-two miles long and connected the Santee river with the tidal head waters of Cooper river, which empties into Charleston harbor. It was completed in 1800 and thus antedated the Middlesex canal of Massachusetts by about three years.

For these earlier works engineers were brought over from Europe. Senf, the engineer of the Santee canal, was a Swede. William Weston came over from England to conduct the construction of a canal connecting the Schuylkill and Susquehanna rivers in Pennsylvania, and afterwards was employed on the Western Inland Lock Navigation Company's canal, in New York, and other canal enterprises in America. Thus during all this first period, there were no American engineers.

The second period, between 1810 and 1830, includes those years when, just after the War of 1812, the eastern section of the United States, void of suitable communications, emerged from a dense wilderness, inhabited chiefly by Indians and wild beasts, and became a prosperous and peaceful country.

For twenty-five years men had been expressing ideas about communications and internal improvements, but public works were spasmodic and without system or definite design. Men seemed afraid to invest capital in such undertakings and none of the numerous propositions could find expression in actual works of construction.

In New York State the attempts to improve natural streams had not proved satisfactory, and agitation for an adequate canal kept growing. The people were progressive, and nature urged them on by placing the best possible course for the most useful canal in the country right through the heart of their State. Thus as early as 1808 the first legislative enactment directing a survey for the Erie canal had been passed, and with it came the birth of engineering, as a profession, in this country. Was it the canal which caused the birth of engineering, or did the spirit of engineering, groping for expression, create the canal? We can not say, but be that as it may, just as the cry of the new Republic brought, in its greatest need, its greatest statesmen—statesmen the like of

which it has never had since and never so needed as then—just so, men most fitted by every natural qualification rose as if by magic, and without previous training built a canal which was not only a success, but remained for half a century the cynosure of engineering eyes.

When a man was needed for preparing plans for the Erie, there was no professional engineer in America, so William Weston, who had returned to England, was once more summoned, but, after the canal commissioners had repeatedly tried to secure his services and had offered a salary of seven thousand dollars a year, he finally refused, saying that he declined the greatest honor ever paid him only because of advanced age and ill health. Fortunately, this resulted in the employment of Americans throughout the enterprise, and in the development of American engineers.

James Geddes, a judge and surveyor of Onondaga county, and a friend of Simeon De Witt, the Surveyor-General, was chosen for the first survey in 1808. He surveyed from Oneida lake to Lake Ontario where the Salmon creek enters it; another line down the Oswego river to the lake; a line from Lewiston to the navigable waters of the Niagara river above the falls; and then from Buffalo east to the tributaries of the Seneca river. In this work he followed the best route that exists for a canal; and the whole was accomplished for the sum of \$673.

When all was ready to commence active preliminary operations in 1816, the Erie canal was divided into three divisions. One was in charge of James Geddes, one in charge of Benjamin Wright, and the third was under Charles C. Brodhead, while Colonel Lewis Garin had the Champlain canal. A sketch of these men and their assistants, together with what they accomplished, will best show how engineering was developed on the Erie canal.

In the days of which we write, judges and lawyers were as a rule surveyors, for they found a knowledge of surveying very useful in determining questions of deeds, leases, etc., and naturally it was from this class of men that the engineers sprang. Until James Geddes was made chief engineer, he continued his duties as judge, but engineering proved more to his liking and it soon occupied his entire attention. In 1818 he ran a remarkable line of test levels. The level to be tested was between Rome and Syracuse. He ran his test line around by Oneida lake, forming

a circuit of nearly one hundred miles. The difference in the levels at the junction was less than one and a half inches. "This result, so satisfactory, exhibits in the engineers a degree of care, skill and precision, in the delicate process of leveling, which has perhaps never been exceeded."² Yet previous to his work on the Erie, Judge Geddes had used a leveling instrument but once and then only for a few hours. The reason for this remarkable skill and accuracy can only be found in the natural genius and character of the man. In the same year Geddes laid out the Champlain canal, another remarkably well-done piece of work.

Benjamin Wright, sometimes called the "Father of American Engineering," was also a judge and surveyor. He had done a little surveying for the Western Inland Lock Navigation Company and had learned by experience how to use a leveling instrument. In 1811 he was asked to make an examination for the location of the Erie from Rome to Waterford. After this he soon gave up all other duties and devoted himself to canal work.

There is little information to be had concerning Charles C. Brodhead or Colonel Garin, but it appears that Brodhead retired to private life at Utica, where he lived almost as a recluse, appearing only once more before the public, when he accompanied the fleet from Utica to New York at the opening of the Erie canal in 1825. A son of James Geddes thus writes:

"As has been stated, all efforts to secure the services of the English engineer, Mr. Weston, having failed, the Commissioners were in great doubt as to the best course to pursue. Under these circumstances, Mr. Geddes and Mr. Wright, having consulted with each other, appeared before the Board, and expressed their confidence in their ability to locate and construct the canals, but expressed a strong desire that the Commissioners should feel a like confidence, if they were to be entrusted with the responsibility. (Personal communication from James Geddes.) Most fortunately for the State, the Commissioners gave these engineers that confidence. But in so doing they encountered the censures of the enemies of the canals, in and out of legislative halls. On the Assembly floor, it was tauntingly asked, 'Who is this James Geddes, and who is this Benjamin Wright, that the Commissioners have trusted with this responsibility—what canals have they ever

²*Report of the Canal Commissioners, January 31, 1818.*

constructed? What great public works have they accomplished? But, really, the Commissioners had no alternative—and now it is easy to see that the course adopted was much wiser than to have entrusted the canals to the keeping of any one man, as would have been the case had the efforts made to secure Mr. Weston been successful.

“To add still more to these difficulties in regard to the engineering, it was said in high places, by men who claimed much knowledge on such subjects, that no confidence could be placed in an ordinary engineer’s spirit level for laying out long lines of canal, and that there was no possibility of running a line for the long levels, that was not liable to be erroneous to the whole depth of the canal. So much annoyance did these cavillers produce, that in the next year it was deemed expedient that in order to settle that matter a full test should be made.” As previously stated, this test showed an error of less than an inch and a half. “The publication of the result of this test level put an end to much of the talk of pretenders to scientific knowledge.”

The engineers showed great sagacity in beginning their work on the middle section, the least difficult and costly, and advancing in both directions. In this way they gradually prepared the people for greater expense and at the same time gave them encouragement by showing them steady progress; and all the while they were learning and feeling their way along, making everything sure, and never sacrificing accuracy. They used such discretion and wisdom in the selection of their assistants that the many enemies of the enterprise made no political capital out of their errors and defects, nor did the State suffer from any want of fidelity and ability in the discharge of their arduous and important duties. Two of the men, who began as assistants, and later became famous, were Canvass White and John B. Jervis.

Canvass White had finished his school life at the age of seventeen. He obtained employment on the Erie under Wright and soon rose to a high rank under that able teacher. He visited England at his own expense and traveled more than two thousand miles on foot to inspect canals there, observing closely

²The Erie Canal, by George Geddes, in *Publications of the Buffalo Historical Society*, pp. 291-293.

the use of hydraulic cement, which had never been manufactured in America and which it was next to impossible to do without. The expense of importing it was almost ruinous. When White returned to America he experimented with limestones found here, and finally produced a hydraulic cement, which was used with perfect success. As we have seen in the story of the building of the Erie, the discovery of this cement was made through the failure of some quicklime to properly slack, but to White's thorough experiments and persistent efforts was due its successful use on the canal. To White was committed the duty of making the plans for all the mechanical structures on the canal. His locks, canal-boats and gates do him ample credit. The levels that he ran were very accurate, one of sixty miles proving to be entirely correct when the water was let into it. In those days the ability to run accurate levels was the test of engineering skill.⁴

In their report of March 12, 1821, the canal commissioners say of Canvass White: "The important services pertaining to the engineer's department on the eastern section, have been, for the last season, chiefly devolved upon Canvass White, Esquire, whose usefulness, from the beginning, has been constantly increasing with the progress of our labors, by his continued assiduity and increasing knowledge."

Mr. Jervis began his engineering career in 1817 as axeman on the Erie. Through the winters he studied surveying during evenings and at odd times. In the spring of 1818 he went out as rodman but was soon transferred to construction work. His skill with leveling instruments early brought him into prominence and he was made resident engineer in 1819. After three years' experience, Mr. Jervis was given the middle section to oversee during its construction. The next year he was given superintendence of fifty miles of completed canal. In a paper read before the American Society of Civil Engineers, he writes: "The work being new, there were frequent failures; but as weak points developed they were repaired, and the work was constantly improved. In many cases it required a good deal of activity to keep up the navigation. This Section was maintained

⁴Stuart's *Lives and Works of Civil and Military Engineers of America*.

at a cost of \$600 per mile, including a large amount of work in graveling the towing-path.”⁵

This only goes to show that it was not all plain sailing. Much of the first work was experimental and, like all experiments, sometimes failed, but these failures were invaluable to the engineers, for by them they learned more than by success. The last quotation shows with how little money the engineers were obliged to get along. The State had great difficulty in financing this gigantic enterprise, no National aid being available, and the engineers were compelled constantly to consider the cost. This helped to develop good engineers. To-day the best engineers are those who can accomplish the most, both in quantity and quality, for the least money.

Mr. Jervis tells us of the willingness of the engineers to *learn* from all sources. He says: “In what pertained to the running of lines and levels, was well understood at that time; but the mechanical department of engineering was practically in its infancy. Such matters were freely discussed with intelligent mechanics, whose skill was supposed to be useful in this department of engineering. The plan for a timber trunk for the aqueducts was prepared and submitted by a carpenter, Mr. Cady, of Chittenango. This plan was adopted in nearly all the wood trunk aqueducts on the canal.”⁶

The enthusiasm caused by the success of the Erie spread like wildfire, not only throughout the State of New York but throughout the entire country. A demand for engineers was at once created, far beyond the possibility of the supply. All the Erie engineers were called to other great enterprises in Maine, Ohio, Pennsylvania and other states, to Canada, and even to the West Indies; the younger men passing on and becoming famous in the third period of American engineering history—the period of railroads.

“The state of New York,” said the canal commissioners, in 1818, “may indulge the proud reflection, that she possesses within herself the genius, the skill, the enterprise, and all the other means, requisite to the accomplishment of an Internal

⁵*Transactions of the American Society of Civil Engineers*, Vol. VI., p. 43. Paper read October 18, 1876; entitled “A Memoir of American Engineering.”

⁶*Facts and Circumstances in the Life of John B. Jervis, by himself*. Never published, manuscript in Jervis Library, Rome, N. Y.

Navigation, whose utility will surpass any work of the kind which preceding ages have accomplished.”⁷ Another writer said:

“For accuracy, despatch and science, we can now present a corps of engineers equal to any in the world . . . The canal line is now one of the most excellent schools that could be devised to accomplish men for this pursuit.”⁸ From another we quote:

“It so happened that the Erie Canal, a magnificent undertaking for its day, had the honor of being the first great pioneer work of the American engineer . . . We are . . . concerned in knowing how such a great project, with a multitude of details, all requiring the skill of the engineer, could have been carried to a successful termination in a land where there was apparently no engineer capable of the task. . . . How could these men, without text books or traditions to guide them, succeed in carrying out so important an undertaking.”⁹

There are several reasons which may be given in answer to this question. Just as Washington, Hamilton and Jefferson built a nation in a land where there were no statesmen, so Wright, Geddes and White built a great canal in a land where there were no engineers. These men were working for a cause, for the development of their native land, and not for personal gain and aggrandizement. Then the character of the men—they were men of courage, energy and skill; sturdy men brought up in a sturdy country; men used to solving all sorts of difficult problems, where necessity was the mother of invention. In this, their first great work, they carefully felt their way, working out each problem with great pains. “What they did not understand they conquered by diligent study, unwearied zeal and sound common sense.”¹⁰

When surveys on the Erie were commenced, there was no model on this continent that could be used as a guide. There were few books on the subject. The country through which it ran was a complete wilderness, yet the work was done remarkably well, in a remarkably short time.

⁷*Report of Canal Commissioners*, January 31, 1818.

⁸Introduction by Charles G. Haines to *Public Documents Relating to New York Canals*, p. xlii. (1821.)

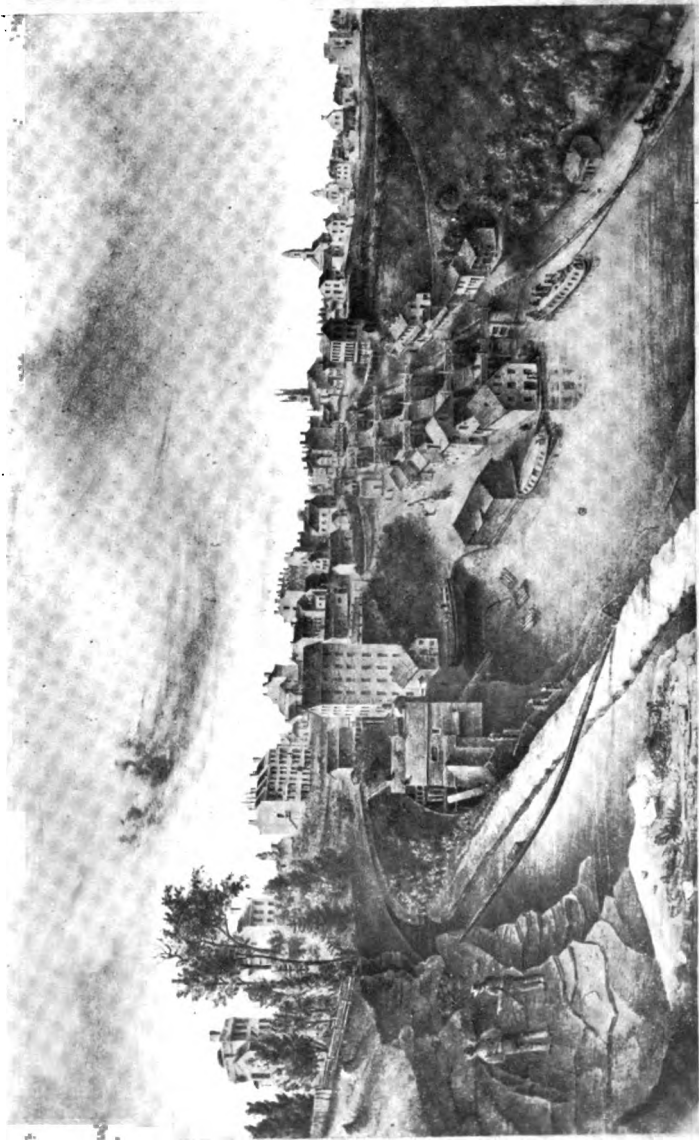
⁹Desmond FitzGerald in *Transactions of the American Society of Civil Engineers*, Vol. XLI., pp. 607-608. President's address; delivered June 27, 1899.

¹⁰*Id.* p. 609.

In the canal commissioners' report of February 20, 1824, we read: "None but those who had examined the line previous to the commencement of the work; who had seen the rude and undulating surface which was traversed, the rocks which were to be blasted, the irregular ledges filled with chasms and fissures which were to form the sides and basis of a water-tight canal; the spungy swamps, and gravel beds, and quicksands, which were to be made impervious to water, and, in short, the huge masses of rough materials, which, with immense labor, were to be reduced to symmetry and form, can duly appreciate the efforts which it has required to surmount these various obstacles."

An ever present fear to the engineers, in laying out the western division, was the inability to obtain sufficient water-supply. If the summit level could be kept lower than the surface of Lake Erie, inexhaustible supplies of water could be drawn from that source. After much debate as to the various routes, the one originally surveyed by Geddes was adopted, and the water was conducted from Buffalo to Lockport by a gentle declivity of one inch to the mile. This declivity was rendered practicable by the fact that the bulk of freight moved from west to east in the direction of the current thus formed.

The problem of supply for the next section was finally solved by the Irondequoit embankment. It was a wonderful piece of engineering for those days,—an embankment, partly natural, seventy feet high, over which the canal was led at such a level that water might be supplied from the Genesee river, and the necessity of another feeder eliminated. It was conceived by James Geddes on his first survey in 1808. He writes in a letter dated Albany, February 22, 1822: "I had, to be sure, lively presentiments, that time would bring about all I was planning, that boats would one day pass along on the tops of these fantastic ridges, that posterity would see and enjoy the sublime spectacle, but that for myself, I had been born many, very many years too soon. There are those, sir, who can realize my feelings on such an occasion, and can forgive, if I felt disposed to exclaim *Eureka*, on making this discovery. How would the great Brindley, with all his characteristic anxiety to avoid lockage, have felt in such a case: all his cares at an end about water to lock up from the



Reproduction of an old drawing (1830), showing the original combined locks at Lockport. Drawing bears the imprint, "Drawn from Nature by W. Wilson."

Genesee river, finding no locking up required. Boats to pass over these arid plains, and along the very tops of these high ridges, seemed then like idle tales to every one round me."¹¹ At the date of this letter the embankment, the subject of an "idle tale," had become a reality.

As soon as the lake region of central New York was reached it was not difficult to get an adequate supply of water, but other problems arose. "One of our most pressing and important duties," reported the canal commissioners, " . . . was to locate the canal line through the Cayuga marshes. . . . The labors necessary here, though unusually fatiguing and unpleasant, were undertaken with alacrity, by our engineer and his assistants; and after several days strenuous exertion, in water from six inches to a foot in depth, the line was satisfactorily established."¹²

Beyond this marsh lay the Seneca river level which was regarded with much solicitude by those interested. It could not be drained at all, while the excavation was from five to eight feet deep, and it was doubted whether the earth had enough consistency to admit of its being excavated by the ordinary processes, or would keep its place upon the embankments. The whole level was, besides, subject to inundation by the Seneca river and the Canandaigua outlet to a depth of three or four feet. It was finally completed, however, by slow and persistent work.

On the middle division the difficulties were not so great, and this portion of the canal was finished and in operation first. "During the past season," say the canal commissioners, in February, 1820, "large boats have actually navigated it for the distance of seventy-five miles; and nothing has hindered such navigation . . . but the setting in of frost. . . . The accuracy of the levels, from one end to the other of this section, has been ascertained . . . this result, so gratifying on every account, can not fail to beget strong confidence in the skill, and a just praise for the care, of our engineer."¹³

¹¹*Laws of the State of New York in relation to the Erie and Champlain Canals.* Vol. I., p. 44. (Albany, 1825.)

¹²*Canal Commissioners' Report*, February 27, 1822.

¹³*Canal Commissioners' Report*, February 18, 1820.

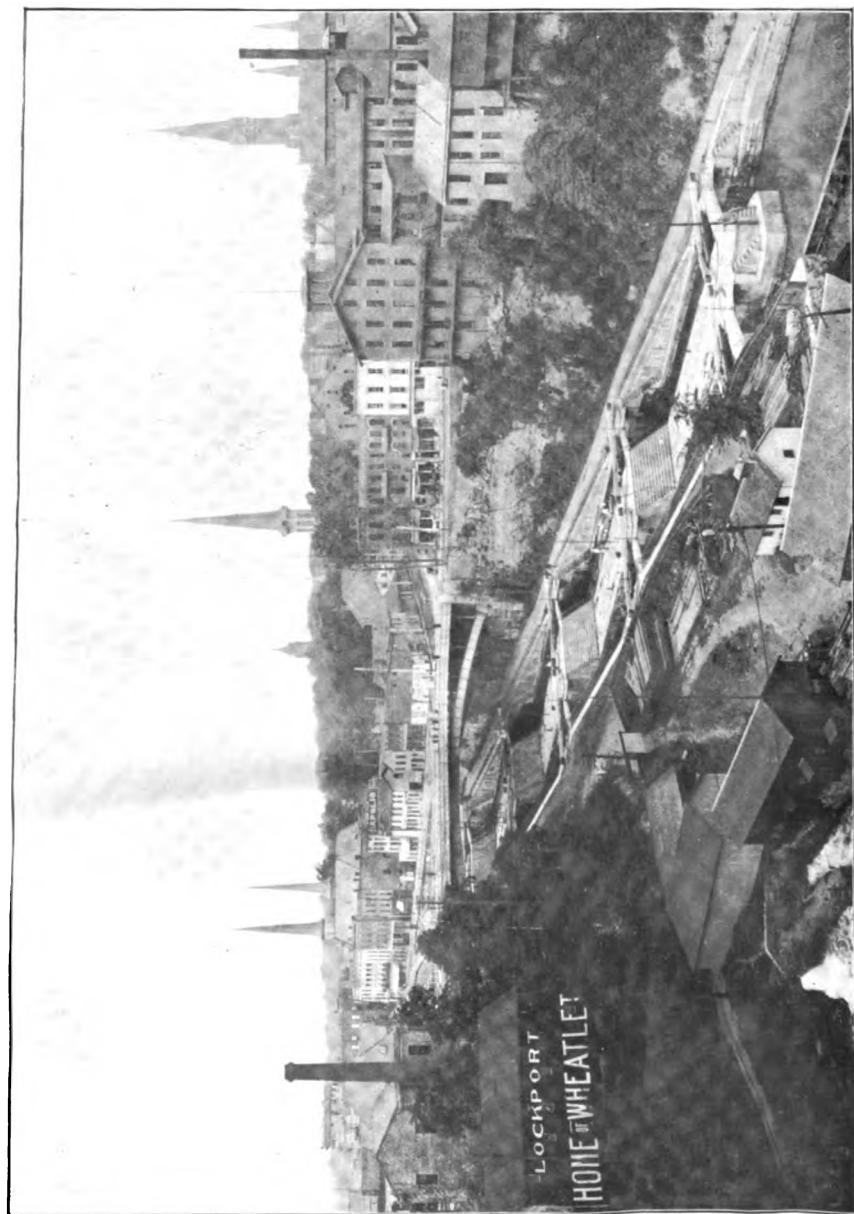
The location of a line between Little Falls and the Hudson was the most troublesome to the engineers. Various routes were carefully explored in an attempt to avoid following the bank of the Mohawk, but were all rejected as impracticable. "The principal difficulties in the construction of this section," say the canal commissioners, "occurs in the narrow passage along the Mohawk, where the hills, crowding to the waters edge, and terminating abruptly, render it necessary, in such situations, to construct the canal either entirely in the river, or partly in the river and partly in the hill; and in either case, the foundations must be laid at the bottom of the river, the work must be carried up above the highest floods, and the outer slope of this high embankment must be secured with a covering of stone, to prevent the earth from being worn away by the rapidity of the current."¹⁴

Even the attempt to continue along the south side of the Mohawk was abandoned at one place, where the difficulties were considered insuperable. Here for a distance of twelve miles the canal was carried along the north shore, crossing and re-crossing the river on long aqueducts.

At Cohoes falls the difficulty could not be thus easily overcome, and the only possible location (until recent improvements in the construction of locks has made available the location adopted for the new Barge canal) was along the abrupt, rocky shores, rising to a great elevation and in many places divided only by the narrow bed of the Mohawk. The canal bed along here was made by blowing off the rock by blasting, and the work was completed in eighty days, although it was predicted that it would take several years.

Referring to the line east from Little Falls the canal commissioners in their report for 1822 say: "The engineer has availed himself of the favorable ground which the flats of the Mohawk afford; and by judicious distribution of his locks, has dropped his various levels on land giving suitable depth of cutting and requiring but little embankment; he has also taken care to keep his line, in all places, above the floods of the river; and avoided, on the other hand, as far as practicable, the sides of

¹⁴*"Canal Commissioners' Report, February 27, 1822.*



BIRD'S-EYE VIEW OF THE COMBINED LOCKS AT LOCKPORT.
(Copyright, 1906, Burt J. Le Valley.)
View showing their present appearance.

steep banks, where the soil is liable to slip, and the canal to be otherwise injured by the torrents from the hills. The correctness of this location was tested by the great flood of November last, which, suddenly raising the Mohawk to an unusual height, was not observed anywhere to approach within many feet of the top of the banks, or to do any injury to the works which were completed."

The execution of the various works on this division taxed to the utmost the experience and skill which had been acquired on the other divisions. The canal commissioners admit that, had that portion of the work been begun first, while the knowledge of the engineers in regard to canals was yet theoretical, it is probable that the attempt to complete the canal would have been abortive, or the failure would have been so great as to postpone any further attempts for many years. To none but the engineers belongs the credit of thus working from the easy to the hard and learning as they worked.

The first locks used in this country (about 1795) had been of wood, but their quick decay made them almost a complete failure. The next attempt was the use of brick, but these could be made to last only about six years, due, probably, to the quality of the mortar which was made with common lime. Canvass White demonstrated the practicability of hydraulic cement just in time to save the Erie engineers much embarrassment. With this cement, locks were constructed of cut stone, with wooden gates, and lacked nothing in their design and mechanical workings. "Locks are the most difficult of all the works which will be necessary," say the commissioners in their report of 1818, "and their construction is already well understood in this State." Along this line Nathan S. Roberts achieved the greatest triumph by his plan for overcoming the difficulties at Lockport, where there was a rise of sixty feet in the canal. The attention of all the engineers on the canal was called to this problem, so great was the importance of its solution, and many plans were submitted, but Roberts, with no advice and with the aid of but very few books, designed a series of five "double-combined locks of twelve feet lift each, working side by side." Although he rose to be a master of his profession, the most

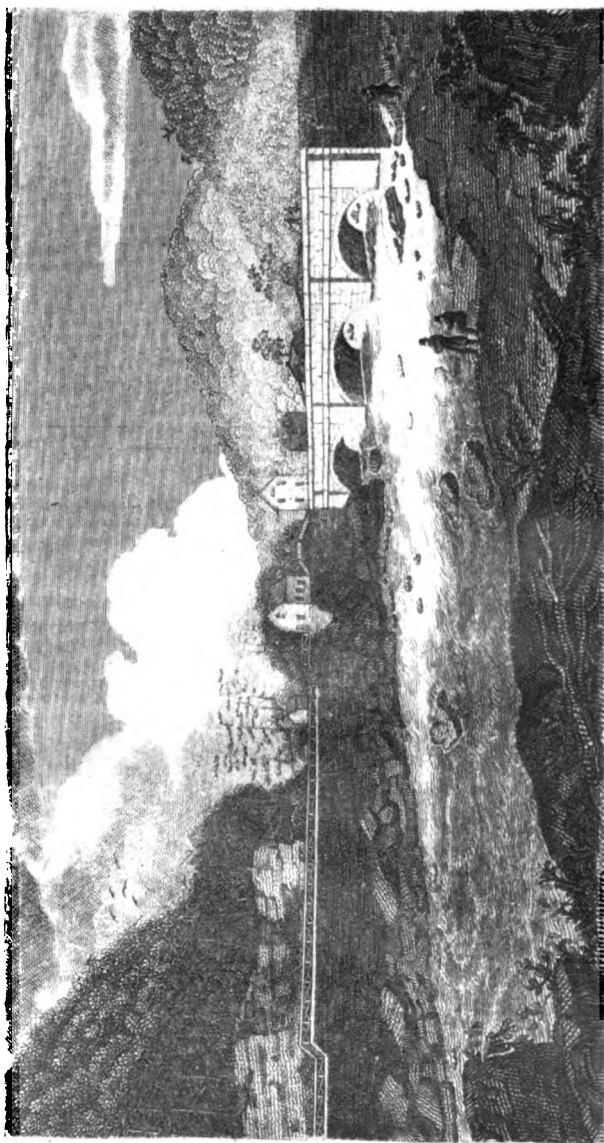
triumphant moment of his career, he said, was the one in which the plans for these locks were accepted.¹⁸

As a display of engineering skill, the aqueduct across the Genesee river at Rochester is worthy of note. It consisted of solid masonry, having nine arches with a span of fifty feet each, and two with a span of forty feet each. The entire length of the structure was eight hundred and two feet. Of the other large aqueducts, one was at Little Falls, taking the canal thirty feet above the Mohawk river on three spans, one of seventy and two of fifty feet. Another was situated four miles below Schenectady; it was seven hundred and forty-eight feet long and rested on sixteen piers. Twelve miles below this was one eleven hundred and eighty-eight feet long, resting on twenty-six piers of well cut stone laid in water-lime cement.

During the year 1825, three hydrostatic locks had been placed in the canal for the purpose of weighing freight and determining the amount of toll. One of these was opposite Troy at the junction of the western and northern canals, one was at Utica, and the third, at Syracuse; the first was of masonry and the other two of wood. They were found to be very useful and their accuracy was often tested with satisfactory results. These hydrostatic locks were constructed in such a manner that the water could be measured with a boat floating in it; then the same quantity was measured without the boat, and the two weights were computed. The difference of weights, of course, gave the weight of the boat, according to the law of displacement.

By the end of the year 1825, the Erie canal stood complete at a cost of a little more than seven million dollars, a successfully working channel of commerce, furnishing a connection between the great West and the Atlantic seaboard. It was three hundred and sixty-three miles long, forty feet wide at the water-surface, and twenty-eight feet wide at the bottom, with a depth of four feet. Eighty-three locks, each ninety by fifteen feet, raised and lowered the boats through a total of six hundred and seventy-five feet, while eighteen aqueducts, most of which were of finely cut stone, carried the canal over the streams and obstructions which it encountered. The time between Buffalo and Albany was reduced from twenty to ten days.

¹⁸ *Stuart's Lives and Works of Civil and Military Engineers*, p. 112.



VIEW OF THE CANAL AND THE GREAT FALLS

Reproduction of an old print, published during the construction of the original Erie canal; design was used also for decorating china.

To repeat the language of the narrator of the celebration attending the completion of the Erie, where he exclaims of the authors and builders of the canal: "Europe begins already to admire—America can never forget to acknowledge, that THEY HAVE BUILT THE LONGEST CANAL IN THE WORLD IN THE LEAST TIME, WITH THE LEAST EXPERIENCE, FOR THE LEAST MONEY, AND TO THE GREATEST PUBLIC BENEFIT."¹⁶

The Erie was scarcely well under way before petitions and memorials began to pour into the Legislature, praying for lateral canals to connect various points throughout the state with the main channel. Several of these propositions met with approval and some eight or ten laterals were constructed. These, of course, made continuous work for engineers for many years, and as the demand continued the supply grew.

Besides the laterals the enlargement of the Erie (1836 to 1862) began shortly after the canal was completed, for it was soon discovered that the original canal could accommodate but a small portion of the traffic. This enlargement gave the engineers a good chance to correct the errors committed during the original work and to make of the Erie the splendid waterway it still remains.

Mr. Jervis, who, it will be remembered, had received his first training from Judge Wright, took an important part in this enlargement, conducting the preliminary surveys and the work of construction. From a paper read by him before the American Society of Civil Engineers, the following facts have been obtained.¹⁷

He was keenly sensible to the mistakes that had been made and he determined to rectify as many as possible. At a point about eight miles above Albany, in a distance of two miles, there were some seventeen locks. One cluster of nine locks and another of four had much contracted pound-reaches. A new location was found for these locks and they were evenly distributed over about three and a half miles. A short distance beyond this point the canal line crossed the Mohawk river twice, on aqueducts aggre-

¹⁶*Narrative of the Festivities, etc., by William L. Stone, printed in Colden's Memoir, p. 331. (New York, 1825.)*

¹⁷*Transactions of the American Society of Civil Engineers, Vol VI., pp. 52-54. Paper read October 18, 1876; entitled "A Memoir of American Engineering."*

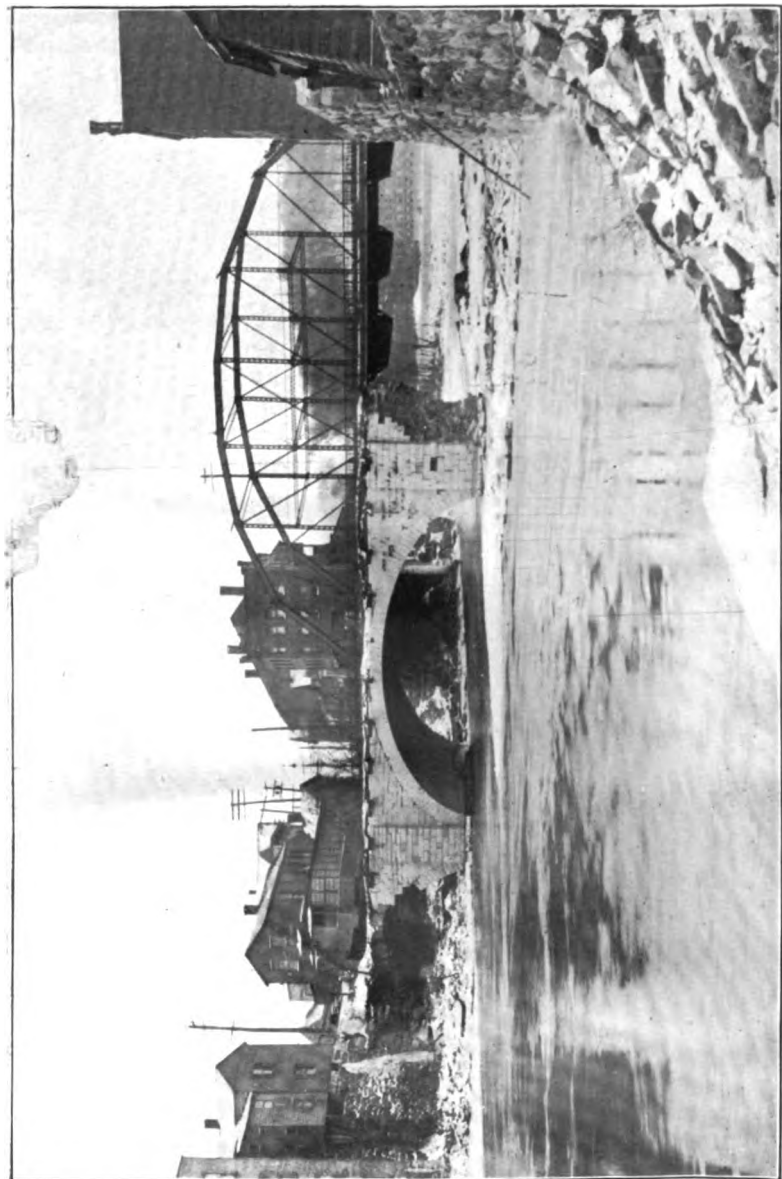
gating nearly two thousand feet in length. A line was surveyed along the south side of the river, with a view to dispensing with these aqueducts. The surveys and estimates were satisfactory enough to induce the engineers to recommend the abandoning of the old line, together with the two aqueducts, but the recommendation was not adopted by the canal board.

In the original canal several streams had been crossed in pools formed by dams. When these streams became turbulent, much vexatious trouble to navigation ensued. Especially was this true at Schoharie creek. During the enlargement, the levels were raised so as to cross these creeks on aqueducts, and this change also provided for carrying through culverts many of the small streams, which previously had been allowed to flow into the canal. It is said that this change restored the levels to the elevation suggested by Mr. Brodhead in his plans, before the canal began.¹⁹ At Little Falls the flight of locks was wholly arranged. Several engineers advised, for the canal prism, depth of eight feet and a width of eighty feet at water-surface, but seven and seventy feet were adopted. The plan of stone arches for the towing-path on the aqueducts, where the height required a timber trunk for the boat channel, was proposed by Mr. Jervis, at that time, and has since been adopted. At the time of the enlargement, the value of the canal was placed so high that all the work was of a very substantial and expensive character.

In that connection it is interesting to refer to the Montezuma aqueduct, which, from its size and the unusual difficulties due to its location, is perhaps the most noteworthy structure on the canals. Van R. Richmond, later State Engineer, planned for and designed the aqueduct and later built the embankment carrying the New York Central railroad across the Montezuma marshes. Mr. David E. Whitford, who has served in the State Engineer's department almost continuously since 1852, writes us concerning these two undertakings as follows:

"Nearly everybody who expressed an opinion (except Mr. Richmond) predicted that the experiment for the railroad crossing would prove a failure, and many doubted the possibility—or the probability at least—of constructing a foundation on the

¹⁹ M. M. Bagg's *The Pioneers of Utica*, p. 107. (Utica, 1877.)



AQUEDUCT AT LITTLE FALLS.

Built during the construction of the original Erie canal; view showing its present condition.

marsh firm enough to sustain the weight of the aqueduct without yielding and settling to an extent that would prove ruinous to the structure. Hon. Silas Seymour was State Engineer when the 'Richmond aqueduct' was brought into use in 1856. Twenty-six years afterwards (in 1882), when General Seymour was State Engineer again, we were making an inspection trip over the Erie canal, and when we reached Seneca river aqueduct, Mr. Seymour made a critical examination of the structure and expressed his delight in not being able to discover a sign of any settlement anywhere.

"A short time before Mr. Van R. Richmond's death he came to the office with his son Denison, and while here then I asked him some questions about the rivers and marsh and the structures in that locality, especially in regard to the aqueduct, for the reason that claims for damages had been filed against the State, the claimants alleging that the aqueduct had caused the damage. Mr. Richmond explained that before designing the aqueduct plan, records had been kept so that they knew approximately the maximum flow of water that would have to be provided for. They at first thought of constructing two aqueducts, one at the Seneca river, the other at the Clyde river. The two rivers, where the canal crosses them, were originally nearly half a mile apart. It was finally decided, however, to turn Clyde river into the Seneca, south of the canal, and build but one aqueduct. Mr. Richmond said that in making his calculations he found that 25 spans or openings, 22 feet wide and 11 feet deep under the trunk of the aqueduct, would pass the biggest floods recorded previous to that time without backing up the water to any appreciable extent, but to be on the safe side and provide for greater floods, he added six more spans, making the number 31 instead of but 25, as at first proposed.

"At the highest stages of the water since the aqueduct was built, careful measurements resulted in finding that the surface of the river was not quite $1\frac{1}{4}$ inches higher at the upstream side of the aqueduct than it was at its downstream side. On the 19th of March, 1865, Howard Soule found the difference to be 0.09 foot. On the 11th of April, 1873, Mr. L. L. Nichols found the difference was exactly $\frac{1}{10}$ of a foot. At the lowest stage of the water in

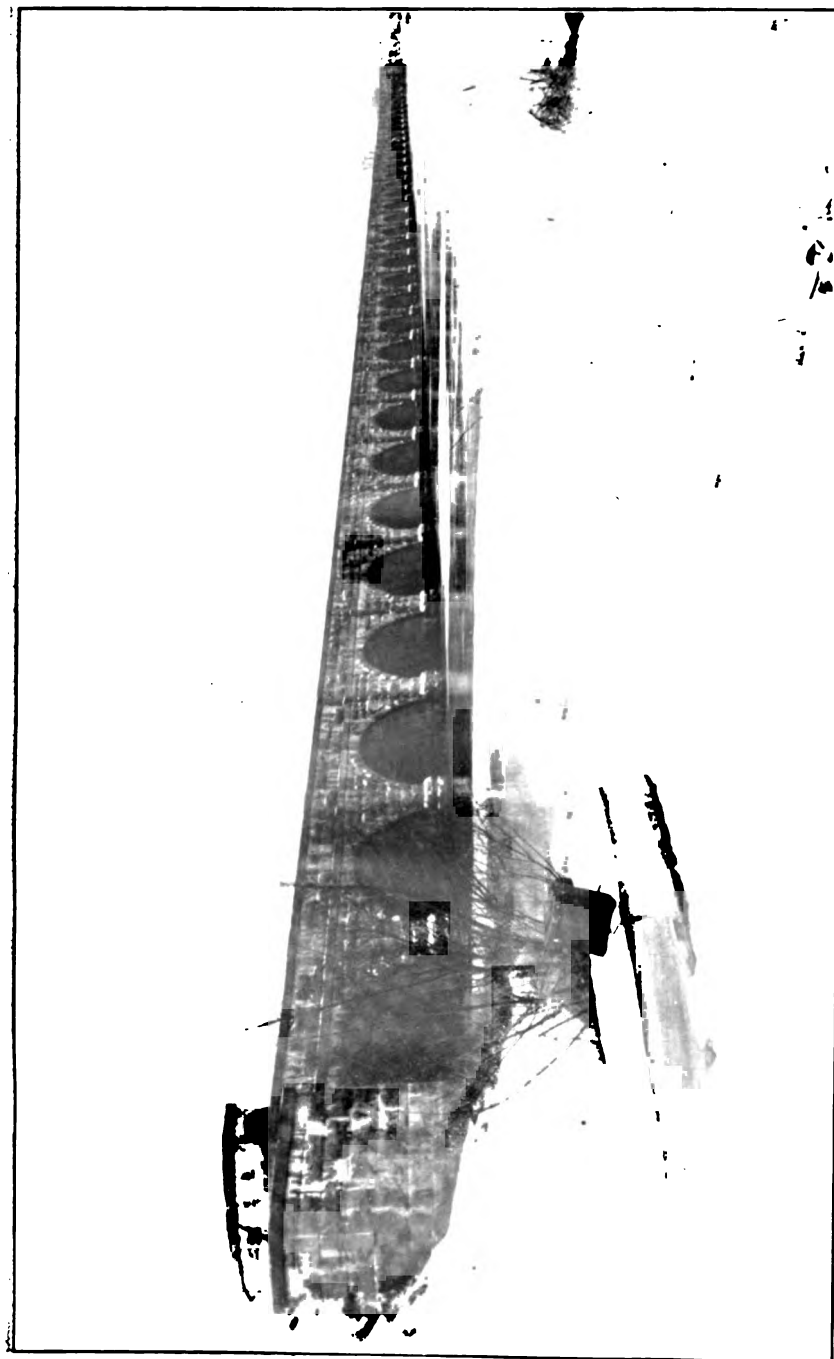
the river a person six feet tall can stand erect in a skiff in passing under the aqueduct, but when the river surface was at its highest stage the lower portion of the aqueduct trunk, for four feet in depth, was submerged."

The cost of this aqueduct was \$216,510.63, covered by two successive contracts. The embankment material or filling was deposited without any preparation upon the natural surface, consisting entirely of vegetable mould, the depth of which to firm bottom is from thirty to sixty feet.¹⁹

Mr. Whitford further writes: "In regard to crossing Seneca river and the marshes by the New York Central railroad (direct line), I had heard before Mr. Richmond told me, and he explained, that piles (by splicing out) were driven to a penetration of 90 feet without coming to a firm bearing, and it was stated by some that each pile went down about as far the last blow as with the first, but that statement was probably an exaggeration. Mr. Richmond did not put it so strongly as that. He stated, however, that the result was so discouraging that the directors called a meeting and decided to abandon that line and adopt one that would give them a firm foundation. The next morning after it had been decided to abandon the line where so much construction work had already been done on both sides of the river, Mr. Richmond—who was Division Engineer—felt so disappointed and badly over the decision that he told the Chief Engineer he was so sure the plan of foundation he proposed would prove a success, he was willing to risk every dollar he was worth in the experiment,—saying he had then saved up \$10,000 from his salary and his profits in manufacturing salt,—and if the foundation proved a failure, he would lose his all. The chief replied that, if he had so much confidence in it as that, they would go ahead and complete the work on that line. They did so and the crossing there has been in use now for nearly fifty years.

"The foundation, as I understand it, is a raft about 1,800 or 1,900 feet in length, made from long heavy timbers, thoroughly connected and so arranged as to break joints and thereby avoid an up and down 'hinge' movement or motion. The bed of the

¹⁹For information on this subject see *State Engineer's Annual Reports*, as follows: p. 108 of 1855, p. 82 of 1856, p. 438 of 1862, p. 75 of 1874.



AQUEDUCT OVER THE SENECA RIVER—CALLED THE "RICHMOND" OR MONTEZUMA AQUEDUCT.
Constructed during the first Canal enlargement; brought into use in the spring of 1856.

river and the marsh was dredged to a uniform grade and the big continuous raft sunk into position, using about 100 cross cribs filled with loose stone. Upon these cribs stone piers were constructed from about low water mark to the required elevation for the stringers and tracks."

This is thought to be the first instance of the use of the mattress construction, which has since become so indispensable in bank protection and difficult foundation work the world over.

The New York canals also served as a field for certain pioneer efforts in the direction of bridge-building. In 1840 the first bridge in America consisting of iron throughout was built by Earl Trumbull over the Erie canal at Frankfort.²⁰ This bridge was composed of cast-iron girders strengthened by wrought-iron rods.²¹ Prior to 1850 it is said that only fifty iron bridges had been erected in the United States and that a large majority of these were built by Squire Whipple over the Erie canal, with spans ranging from 70 to 100 feet.²² The connection of Whipple, who is regarded as the "Father of American rational bridge design," with the canal is interesting. He is said to have been first induced to enter the field of engineering while at Union College and especially through his proximity to the canal at that time. His invention in 1840 and later construction of the first enlarged weigh-lock scale ever constructed upon the Erie canal is mentioned in his biography, which may be found among the sketches of engineers who have served in the State engineering department (see Part Two, chapter III). In 1847 this "modest mathematical instrument maker, [having] . . . without precedent or example, evolved the scientific basis of bridge building in America,"²³ embodied the results of his study in an unpretentious book, containing two "essays," from the first of which we extract the following:

"Having received Letters Patent for an 'Iron Trussed Bridge' upon the general plan of the arched truss [now known as the bow-string truss], . . . and constructed two bridges thereon,

²⁰See *Transactions Am. Soc. C. E.*, Vol. LIV., p. 216.

²¹See *Roofs and Bridges*, Merriman and Jacoby, Part 3, p. 10. (1904.)

²²See *Trans. Am. Soc. C. E.*, Vol. XXXVI., pp. 527-530; *Memoir of Squire Whipple*. Also *Johnson's Universal Cyclopaedia*, article *Bridges*.

²³See *Trans. Am. Soc. C. E.*, Vol. LIV., p. 217; presidential address of C. C. Schneider, entitled "The Evolution of the Practice of American Bridge Building," delivered June 20, 1905.

over the enlarged Erie canal, (72 and 80 feet span,) one of which has been in use six years, it may be regarded as a demonstrated fact, that bridges may be sustained by iron trusses. Also, that the cost, for the above class of bridges, is only about 25 per cent more than the same class of bridges of wood, as *heretofore built*, under the most favorable circumstances, on the Erie Canal. That the iron portion, constituting some $\frac{3}{4}$ of the whole as regards expense, in the iron bridge, gives fair promise of enduring for ages, while the wooden structure can only be relied on to last 8 or 10 years. . . . It is probable that bridges may be built for \$500, as about the minimum, of equal strength and convenience, and nearly the same durability as those hitherto built upon the Erie Canal Enlargement at a cost from 800 to \$1,000."²⁴

The type of truss which bears Whipple's name was first constructed in 1852-3 and extensively used from then until about 1885. In this truss Whipple is credited with introducing the first inclined end-post ever used and the first pins employed in a truss of similar character. In 1873 he published an enlarged edition of his work on bridge-building and, in this volume, described at length his new "Patent Lift Drawbridge," concluding with the observation that, "After all, practical test is generally the only satisfactory means of determining the value and utility of any mechanical device."²⁵ Shortly afterwards the Erie canal again afforded him an opportunity of establishing the practicability of his designs, for he then built a successful lift-bridge over the canal at Utica.

In speaking of the early engineers in this country, D. S. Gregory writes as follows to a son of Benjamin Wright: "Thus I know that the commissioners thought they must send for some great engineer from England from the Duke of Bridgewater's Canal, to teach us how to build a canal, fearing to trust our common-place Americans. At length they settled upon that plain, unsophisticated and unpretending land surveyor—nothing but an old-fashioned land surveyor—Benjamin Wright, for the en-

²⁴*A Work on Bridge Building: consisting of Two Essays, the one elementary and general, the other giving Original Plans and practical Details for Iron and Wooden Bridges*, by S. Whipple, C. E., pp. 42-3.

²⁵*An elementary and practical Treatise on Bridge Building, an enlarged and improved edition of the Author's original Work*, by S. Whipple, C. E. pp. 346-352.

gineer on the Erie, and James Geddes on the Champlain Canal. From this school arose nearly all the canal engineers who have lined the map of the country with their works of internal improvements."²⁶

Yet this old-fashioned land surveyor, beginning his engineering career at the age of forty-five, within the next twenty-five years became associated, as chief or consulting engineer, with the most important improvements on this continent, such as the Erie, the Chesapeake and Delaware, the Delaware and Hudson, the Chesapeake and Ohio, the Welland and the St. Lawrence Ship canals, and the Harlem and Erie railroads.

Many of his associates on the Erie were called to prominent positions in other states. Geddes, who was sixty-two when the Erie was completed, responded to invitations from Ohio and Maine for assistance in the work of constructing canals, but later was obliged to decline an important Government position on account of his advanced age. White became chief engineer of the Union, the Lehigh, and the Delaware and Raritan canals, and consulting engineer of the Delaware and Chesapeake canal and the Schuylkill Navigation Company, dying at the age of forty-four. Roberts was made chief engineer of the Pennsylvania and the Pittsburg and Kiskiminetas canals and of the Muscle Shoals in the Tennessee river. Bates was called to be chief engineer of the Ohio canal system, of the Louisville and Portland canal, and the Erie and Kalamazoo railroad, and served also with the Auburn and Rochester railroad and the Niagara River Hydraulic Company. Jervis became chief engineer of the Delaware and Hudson canal, the Croton Aqueduct, the Albany and Schenectady and the Hudson River railroads.

Others of these early engineers remained for many years on the canals, and their names, together with those of their successors, have become very familiar in the canal world, such names as Hutchinson, Barrett, Childs, Nichols, Fay, McAlpine, Richmond, Goodsell, Storey, Hartwell, Kimball, Taylor, Jerome, Hanks, Cooper, Evershed, Bisgood, Gere, Whitford, Soule, Tubbs, Beach, Kaley and many others,—men who received their early

²⁶Stuart's *Lives and Works of Civil and Military Engineers of America*, n. 68. (Mr. Gregory was for many years in the office of the Comptroller of New York State.)

training on the canals, many of them spending a lifetime in the service, and a few still remaining in that service.

Although many of the best works of these early engineers are no longer visible, swept away by the swift onrush of progress, monuments of their skill and labor, perpetuating their memory, still remain. Much of their best effort never assumed tangible form, but lay in the transmission of their experiences, their failures, and their successes to the generations of engineers who were to follow. Their triumphs were largely due to their personal characters. Judgment, accuracy, economy and integrity marked every step of their work. Best of all, they were Americans. Only two foreign engineers were ever employed on the construction of the original Erie,—an Irishman and a Frenchman. They held subordinate positions and remained only a year.²⁷ The following was the toast to the engineers at the celebration attending the opening of the canal: "The Canal Engineers and their Associates—their science marked out the path from the Lakes to the Ocean. It is the pride of the Republic to call them her native sons."²⁸

One cause of the success of these engineers may be found in their freedom from the restraints of political patronage and official favoritism and their liberty to choose competent assistants. As Mr. Jervis says: "Whatever may have been the views of men high in official station, it was not regarded proper to interfere with the economical conduct of business on the canal. In all my intercourse for seven years no intimation was given me to look to the right hand or the left for any motive, but the strict interest of the canal. When superintending, Commissioner Seymour did not in the least give direction or even intimation as to whom I should employ in any department of work. I selected the men I wanted, with strict reference to the ability I supposed they had for the work to be done."²⁹

"Many of the distinctive characteristics of American engineering," said one writer, "originated with those Erie canal engineers. We practice their methods to-day. . . . As a

²⁷*Laus of the State of New York, in relation to the Erie and Champlain Canals*, Vol. I., p. 107. (Albany, 1825.)

²⁸Colden's *Memoir*, p. 288.

²⁹*Facts and Circumstances in the Life of John B. Jervis, by himself*. Manuscript in Jervis Library, Rome, N. Y.

class they wrote little. There were then no engineering papers prepared, and no engineering societies to perpetuate them, if they had been prepared. They were not scientific men, but knew by intuition what other men knew by calculation. . . . What science they had they knew well how to apply to the best advantage. Few men have ever accomplished so much with so little means."³⁰

William J. McAlpine, one of those engineers who received his early training on the Erie canal, in a paper before the American Society of Civil Engineers, speaks as follows: "A century ago, our country, then so recently settled, almost belonged to the ruder conditions of society, and there was hardly any call for the services of an engineer. During this century society here has advanced with a stride unparalleled in the history of the world; and with it has been the demand for the science, skill and talent of the engineer to such an extent that it has brought it up from a trade to the dignity of one of the liberal professions.

"Even one-half of a century ago the most eminent of our engineers were chiefly those who had been recruited from other professions or trades, to whom the modern application of science was almost unknown. . . .

"We of the older school have fought a long and severe battle to bring the profession up to its present position. The rising school must continue the contest with the same earnestness to maintain its rank with the other professions."³¹

³⁰Ashbel Welch in President's Address. *Transactions of the American Society of Civil Engineers*. Vol. XI., p. 168. Address delivered May 16, 1882.

³¹President's address. *Transactions of the American Society of Civil Engineers*, Vol. I., p. 54. Address delivered September 2, 1868.

CHAPTER XXV.

THE INFLUENCE OF THE ERIE CANAL.

Treated especially with reference to the first half of the Nineteenth Century.

"New York has always been deeply interested in ships and canals and railways, the means and instruments of communication which have made the modern world possible and brought in, in a rough preliminary way, the brotherhood of man."

Hamilton W. Mabie.

THE BROADER PHASES OF THE INFLUENCE OF THE CANAL.

To the spread of republican ideas of government in the last years of the eighteenth and the early decades of the nineteenth century may be ascribed the intellectual awakening which swept over Europe and reacted upon America in the latter part of that period. The revival was marked during its most brilliant decade, namely from 1830 to 1840, by such significant events as the publication of Lyell's *Geology* and of the first volumes by Alfred Tennyson, by the formulation of the cell theory in biology, the invention of the friction match and daguerreotype and by the establishment of the railroad, the electric telegraph and the ocean steamship. The peculiar diversity of interests of the period is apparent. It is also clear that then, as in no previous reawakening, intellectual activity was turned into practical, utilitarian and commercial channels.

In America—a new country, newly launched on a course of independent action—the prevailing spirit naturally expressed itself in commercial pursuits. The need of the hour here was expansion, and, as subsidiary to it, communication—some means by which waiting thousands could be poured into the interior, there to develop vast, inert resources—a line of ready intercourse, which should supply the frontier from the coast and the coast in turn from the frontier, each with its respective wants—a link to bind the straggling settlements already forming with the great nourishing mother settlements east of the Appalachian divide, and to weld the two in one, before the opportunity had been

given them to grow apart. It is precisely in this light that the Erie canal appears to be a manifestation of the spirit of the times.

A work which compares favorably with any wonder of the ancient world in respect to grandeur and shames them all in point of utility, our gigantic waterway stands undeniably as the most enduring, single monument of that period in America. As the progenitor of new and wonderful modes of communication, and more than all else, as an economic force, stimulating and guiding the nation in its development, the canal has wielded a tremendous influence and possesses a peculiar interest for the historian. An attempt to analyze this influence, however, leads to the conclusion that its manifestations are very diverse, that it has permeated many phases of industry and extended far and wide, but so harmonizing with and amplifying other beneficent influences, that its identity is often lost or merged in the prevailing atmosphere of the age.

Tributes to the widespread benefits conferred upon humanity by the improved means of communication introduced during the early canal era are not lacking. A contemporaneous authority, Thomas Tooke, in his *History of Prices . . . from 1793 to 1837*, states the case very forcibly with especial reference to England. "The high range of prices," he says, "which prevailed in the closing years of the past, and in the earlier part of the present century, contrasted with the comparatively low range observable in the period which has elapsed from 1819 to the present time [1838], forms a very striking feature in the history of the agriculture and commerce of this country."¹ The author deduces, in the course of two volumes, devoted to the subject, six causes to which he ascribes the phenomenon of the decline of prices and among these he specifies: "The removal of obstacles from the several sources of foreign supply; a great extension of some of them; and the discovery of new ones," and again: "A great reduction of the charges of importation . . . ; and the improved, and cheaper, and more rapid internal communications," the "fall of some commodities, in a greater degree than the previous rise, being," as he later explains, "the effect of

¹*History of Prices*, Vol. I, p. 1. (London, 1838.) The Erie canal was first used through a portion of its length in 1819.

improvements in machinery, in cultivation, in science, and in the facility and comparative cheapness of communication."²

It is thus possible to affirm with some measure of scientific certainty that, even before the advent of railroads, the improved facilities for transportation materially affected prices and reduced the cost of living throughout the commercial world. Exactly how much any one project contributed towards this net result is, however, a matter of speculation. Only in local instances can we adduce proof at all conclusive, and the purpose of this chapter must be, therefore, to study specific and local effects. It is profitable, nevertheless, to preface this statistical study with a few more general considerations.

The fact is well known that the presence of navigable rivers, penetrating the interior from the coast-line, has always noticeably affected the development of a country and the movement of population inland. Australia is an instance of a land peculiarly deficient in navigable watercourses and the slow and retarded character of its inland growth is a distinctive feature of its history. The United States possesses a wealth of such streams and rivers and its settlements have generally advanced along these waterways and afterwards filled in the intervening territory. The Appalachian chain of mountains, however, early presented the one great barrier to progress across the interior. Through this continental divide there are four natural passes, each in the early days traversed by an Indian trail, subsequently expanded into wagon-roads. By far the most favorable of the four, likewise the most northerly, lies across the state of New York. It was here that the genius of our statesmen and engineers executed the mighty task of supplying the deficiency left by Nature and connecting the extensive inland waterways with the coast by means of the Erie canal.

Let us consider briefly what other possible routes suggest themselves and what changes might have been wrought in the history of our country, had the building of the canal been delayed or abandoned. The St. Lawrence river is the natural outlet of the Great Lake system. In pre-canal days many interior products found their way to port at Montreal. In fact, Wash-

²*History of Prices.* Vol. II, pp. 348 and 354.

ington's chief expectation for the Potomac River Company was that it would capture the Detroit fur trade from Montreal, and the Western Inland Lock Navigation Company, later on, inherited a similar ambition.³ The route of the St. Lawrence is impeded by obstructions to navigation. It is at a disadvantage in being more northerly and necessitating a longer course in restricted channel than, for example, the Erie canal and Hudson river. Notwithstanding this, it saves, in comparison with the latter route, some four hundred and fifty miles of distance for freight destined for Liverpool, and admits of ocean navigation as far up the St. Lawrence as Montreal. In spite of the American preoccupation of the field, the opening of the Welland canal took place in 1831, six years after the completion of the Erie, and became the first step towards the improvement of the St. Lawrence route. Up to the present time the Canadian Government has spent, all told, about one hundred million dollars on this system and proposes to duplicate the expenditure in the course of a few years. Meanwhile American commercial interests are keenly alive to the menace of Canadian competition. Add to this commercial issue the strategic importance of the outlet to the Great Lakes—foreseen by Wellington when he asserted, in connection with the War of 1812, that America would not be subdued, until the Great Lakes had been acquired and brought under the control of English navies—and the conclusion is irresistible that, without the Erie canal, the upbuilding of a foreign rival route would have been greatly encouraged, and the absence of our American waterway would have enriched the neighboring domain commercially and strategically almost in proportion as it would have tended to impoverish us.

Probably without the Erie canal, transportation systems across the state of Pennsylvania would have built up that state and its metropolis at the expense of our own, but such a possibility belongs rather to the treatment of local than of national benefits.

There is, however, a third possibility which enables the historian to measure by negative means, so to speak, the benefits of

³The rivalry between the two routes from Detroit even in later years is confirmed in the following statement from Farmer's *History of Detroit and Michigan* (p. 889): "The completion of the Erie Canal to Buffalo in 1825 was a notable event in the progress of transportation facilities, and freights were greatly reduced as soon as it was opened. . . . The opening of the Welland Canal in the fall of 1831 was also of great advantage."

the canal to us as a nation. There are two principal commercial outlets for the Mississippi valley. The Gulf route has been longer developing, but is increasingly recognized as a formidable competitor of the direct route to the Atlantic seaboard. It is not probable that, in the absence of the Erie canal, the southerly route, remote as it was from the center of business activity, would have become what the easterly route actually did become. There is abundant evidence, however, that even prior to canal days the Gulf route, aided by climatic advantages, threatened the supremacy of the more easterly and northerly outlet, and that, in the words of a recent student of the transportation problem, "the opening of the Erie Canal, in 1825, gave the first decisive impulse to commerce to move across the country instead of down the Ohio and Mississippi rivers. In later years," the same authority further says, "the construction of the great trunk lines, parallel to the northern water route formed by the Great Lakes and Erie Canal, strengthened a movement which had already become firmly established."⁴ Had the Mississippi river formed the principal outlet of the rich interior of our country, no one will deny that the subsequent history of the nation would have been materially modified, and modified in a twofold way—commercially and politically. With the products of the north-central states pass-

⁴Quotation from *Transportation on the Great Lakes of North America*, Geo. G. Tunell, House Document No. 277, Fifty-fifth Congress, second session, pp. 49-50.

Washington, in a letter written in 1783 to the Marquis de Chastellux, proclaimed with the rare discernment of which he was capable that, "the Western states . . . hang upon a pivot. The touch of a feather would turn them any way. They have looked down the Mississippi till the Spaniards . . . threw difficulties in the way; and they looked that way for no other reason than because they could glide quietly down the stream, . . . and because they had no other means of coming to us but by land transportation and unimproved roads."

From Flint's *History and Geography of the Mississippi Valley*, published in 1832, we learn that the lower parts of the states of Ohio and Indiana had always enjoyed a great advantage in being able to send their products with almost equal convenience southward by the Mississippi or eastward to the lakes and the Atlantic coast.

Another contemporaneous evidence of the preparedness of the Mississippi river route to serve the community thus early consists in the fact that the first survey for the Illinois and Michigan canal (extending from Chicago to the navigable portion of the Illinois river, and thus connecting permanently the watersheds of the Great Lakes and the Mississippi, which are often naturally united at this point in seasons of extreme high water) was made in 1816, or nine years before the Erie Canal was opened. A traveler, Patrick Shirreff, in a record of his visit, published in 1835, wrote of Chicago, then a hamlet: "When connected with the navigable point of the river Illinois, by a canal or railway, [it] cannot fail of rising to importance." (*American History Told by Contemporaries*, edited by Albert Bushnell Hart, extract from book of Patrick Shirreff.)

From table No. 17, among those appended to this chapter, may be seen how acute the commercial rivalry between the states of New York and Louisiana actually became, notwithstanding the advantages of the canal to the former. In 1841 the value of the exports of New York was less than that of Louisiana.

ing down the Mississippi river, Chicago could hardly have become so great an emporium as it is, and not a little of the commercial prestige of Boston, New York and Baltimore during the last century would then, perchance, have descended upon New Orleans and Mobile and Galveston.⁵ More portentous still than this commercial alliance between the Northwest and the South is the consequent probability that out of it there would have grown racial sympathy and political kinship, with what effect upon the great issues which culminated in the Civil war or upon the present constituency of the American land and people, we can only conjecture.⁶

This consideration leads directly to what is probably the most signal benefit the canal has ever bestowed upon the nation, what Washington in his *Farewell Address* recognized as the great need of the hour,⁷ what Clinton and Calhoun and other famous advocates of internal improvements deemed of first importance—the service such works would perform in binding together, by a more extensive and sympathetic intercourse and interdependence, the great divisions of our land. And these men lived to see the forces they had set in action operating to accomplish the demoli-

⁵The authority before cited (Tunell), on the pages already referred to, well characterizes the radical commercial changes which would result even at the present day from a shifting of routes. "The Gulf roads hold that the central West and Southwest," he states, "should export their surplus products through the Gulf ports and receive imports through the same cities. This proposition is nothing short of revolutionary. It means a breaking away from the old channels of shipment through Chicago and New York and the other eastern cities; further, it means that the northern water route and the eastern trunk lines are no longer to be the dominant power in moving the products of western farms."

⁶John L. Heaton, in his *Story of Vermont* (p. 169), says: "It requires no fanciful imagination to conceive that the opening of the Erie Canal was an agency which did more than almost any other to curb the power of slavery."

See in this connection also the statements made in this chapter following the discussion of the *Average Amount of Land Possessed by the Individual Engaged in Agriculture*.

⁷"Every portion of our country finds the most commanding motives for carefully guarding and preserving the union of the whole

"The North, in an unrestrained intercourse with the South, [etc.] . . . The East, in a like intercourse with the West, already finds, and, in the progressive improvement of interior communications, by land and water, will more and more find, a valuable vent for the commodities which it brings from abroad, or manufactures at home. The West derives from the East supplies requisite to its growth and comfort; and, what is perhaps of still greater consequence, it must of necessity owe the secure enjoyment of indispensable outlets for its own productions, to the weighty influence, and the future maritime strength of the Atlantic side of the Union, directed by an indissoluble community of interest as one nation. Any other tenure, by which the West can hold this essential advantage, whether derived from its own separate strength, or from an apostate and unnatural connexion with any foreign power, must be intrinsically precarious. . . .

"In this sense it is that your Union ought to be considered as a main prop of your Liberty and that the love of the one ought to endear to you the preservation of the other."

Farewell Address.

See also foot-note at the end of this chapter (p. 908).

tion of sectional jealousies, the upbuilding of mutual reliance, the dissolving of provinciality and the substitution of a broad-minded community of interest and fraternity of spirit. All men could see then what only the few had discerned before, and the time has long since come when all can understand why Lafayette pronounced the Erie canal "an admirable work of science and patriotism."

We have now discussed, in passing, some of the broader aspects of the influence of the canal. There was one event, however, so near, chronologically, to the period under consideration that its results may seem to be indistinguishable from those we seek. That event was the War of 1812. Its baneful effects were exceedingly transitory, as registered in the statistics of the day. With a marvellous vitality and resourcefulness, the nation had recovered almost before the "Treaty of Ghent" was signed, and long before the first shipments were made on the Erie canal. The beneficent effects of that war consist: first, in educating the Easterner in respect to the opportunities awaiting him in the West, and second, in teaching him the need of more efficient facilities for transportation thither. These were merely initial impulses, however. They were good as far as they went, but they did not go far. To quote the words of Goldwin Smith, "The true instruments of consolidation were, not the war, but the improved means of intercommunication." Though it has been termed the second war of independence, continues Mr. Smith, that is, the war for a mental as the first had been for a bodily independence, yet "mental independence was promoted, not by the war, but by emigration westward which left old world ideas and sentiments behind." To how great an extent our Erie canal, the mightiest of all these "improved means of intercommunication," affected the "emigration westward" we shall now attempt to show.

THE EFFECT OF THE CANAL IN DEVELOPING THE BORDER COUNTRY OF THE GREAT LAKES.

At the time of the agitation in behalf of the canal and through the early days of its operation the most rapidly developing section of the land comprised the states carved from the great Northwest Territory and these constituted precisely the section border-

ing the Great Lakes and so the most sensitive to the impetus afforded by the Erie canal. It is easy to see by a glance at table No. 1, in the appendix to this chapter, that these states were relatively insignificant in 1810, and for the most part in 1820, at the beginning of canal times; also that they have become foremost, with the exception of a very few, in the Union of today, with its fifty-two states and territories and its eighty millions of people. And not only in population have the shores of the Great Lakes attained distinguished rank in our prosperous land, but they have become, in the phraseology of the twelfth census, "the great manufacturing belt of the country," contributing more than one-half of the total value of the manufactured products of the entire United States. It is the unnumbered craft which ply busily upon these waters that make possible that manufacturing supremacy. The census of 1900 reports that "more than five times as many vessels" pass through the United States and Canadian canals at Sault Ste. Marie as through the Suez canal, and that the ton-mileage of its freight traffic is "equal to nearly 40 per cent of that of the entire railroad system of the United States." Therefore it has become the "greatest internal waterway in the world."⁸ This sufficiently demonstrates the fact that, whereas there were probably in 1812 but three vessels navigating the lakes⁹ and where there was thus early in the century such

⁸*Twelfth Census*, 1900, Vol. 7, p. lviii.

⁹See *Transportation Systems in the United States*, J. L. Ringwalt, p. 121, *et cet.*

The different steps in the development of the traffic of the lakes are variously given, but in general it may be said that steam vessels were introduced upon the lakes west of the Niagara river and run regularly between Detroit and Buffalo (Black Rock) just before the first opening of the Erie canal. It is stated that in the decade of 1820-30 eight steamers were built upon the lakes. (*Report of the Committee on Canals of New York State*, 1899, p. 196, and *Encyclopedia Americana*, article "Commerce.")

The following quotations will serve to illustrate the growth of the lake commerce about 1820-30:

"It was in this year, 1825, that the Erie Canal was completed, and it evidently at once stimulated trade. In 1827 the number of vessels arriving and departing [at Buffalo] had increased to 972 [from 120 in 1820 and 359 in 1825], two and three-quarter times as many as in 1825." (*Buffalo Historical Society, Publications*, 1902, Vol. V, p. 244, from paper on *History of Buffalo Harbor*, by Major T. W. Symons and J. C. Quintus, M. E.)

"The opening of the Erie canal has advanced the commerce of the upper lakes from comparative insignificance to the foremost rank. Prior to 1818, there were no steamboats on the upper lakes, and the aggregate of American tonnage was 2,068 tons. The tonnage owned on the Canada side was inconsiderable.

"From 1817 to 1825, there were but three steamboats launched upon the upper lakes. The aggregate tonnage in 1825, including steamboats, was about 2,500 tons. In 1840, the aggregate tonnage of steamboats alone exceeded 17,000 tons; and of other craft there was about 18,000 tons. There are about sixty steamboats now employed on the upper lakes, and the

difficulty of inland communication as to render intimate relations and interchange of products impracticable, such condition has been long extinct; that the inland has been able to profit from its improved facilities for transportation, whereby its output has been rendered many times more marketable and its lands have brought far greater returns. Yet just how much of the stimulation is attributable to any one influence among the many which contribute to the development of a particular region, it is always impossible to say. Our judgment must be based on certain specific instances, which are assumed to be representative, although we cannot know with assurance that they are not abnormal or accidental; or else we may study the growth in its salient features and seek to determine from their uniqueness and correspondence, chronologically or otherwise, with the action of such forces, just the extent to which this influence has prevailed and regulated subsequent events.

It has indeed been asserted by many, and notably by as high and supposedly as impartial a tribunal, or investigating committee, as the country could well furnish, that the thrift and activity of this great Northwest (now the Middle West) belt is the outcome of its facilities for through water transportation. At least the "Select Committee [of the United States Senate, appointed in 1872] on Transportation Routes to the Seaboard"—of which Mr. William Windom, representing in the Senate the interests of the extreme lake state of Minnesota, was chairman—reported

number of other vessels is 225" (*Progress of America*, London, 1847, by John MacGregor, Vol. II, p. 759). See also foot-note No. 12.

In Vol. I of the *History of the Great Lakes*, edited by J. B. Mansfield and published in 1890, occurs the following (pp. 3 and 264): "One of the great works of the immediate future will be the construction of the Nicaragua canal. . . . But more important far to the North American continent than even this stupendous enterprise has been the development of navigation on the Great Lakes. . . ."

"Farming languished beyond the Alleghanies until the completion of the Erie canal. Then was given an impetus to Western emigration which continued until the region of the lakes was populated."

"Prior to 1824 the harbors in the lakes had received no attention direct from the government. . . . After much effort, a law was passed in 1826 making appropriations and providing for the examination, survey and improvement of the harbors on the northern lakes." The author then quotes from the annual report for 1837 of Henry Smith, general superintendent of public works for Lake Erie, who maintains that, "until the commencement of the system of improvement of the lake harbors by the Government of the United States, . . . the south shore of Lake Erie . . . was a wilderness," that the improvements had "entirely changed all this," and that the "western portion of the State of New York, the northern part of Pennsylvania, Ohio, Indiana and Illinois and the whole of Michigan, [owed] their present settlement [writing in 1837] and improvement in a very great degree to this cause."

that in its opinion "the railroad interests practically control the transport of grain from all that part of the states of Illinois and Indiana situated south of a latitudinal line 60 miles south of Lake Michigan," referring to competition of rail and water for shipments to the seaboard.¹⁰ And the committee gives the water system credit for governing rates, above that parallel, even on that portion of the traffic which it does not directly handle. This view of the utility of the waterways is certainly no less applicable to the period which we desire to examine and from its authority and definition of statement is as forceful as it is suggestive.¹¹

Pursuing, however, an independent course of study, which may at least convey some intimation of the services of the canal, we find that table No. 2 emphasizes the extraordinary development of these border states during the early canal days and especially that of Michigan after the opening of the canal—the peninsula state of Michigan being perhaps the most restricted to that outlet, on account of its remoteness from the Mississippi and Ohio rivers. This, as has been stated, was the most rapidly developing section of the country. Table No. 1, already cited, will show, on the basis of rank of the several states, when the most conspicuous strides in the population of each state took place, namely, in 1810 to 1820 for Ohio, 1820 to 1830 for Indiana, apparently in the last 'twenties and in 1830 to 1840 for Illinois and from 1830 to 1840 for Michigan. It will thus appear that their greatest impulses to development occurred, except in the case of Ohio, simultaneously with the early effects of the canal.

Yet in point of magnitude of participation in the business and benefits of the canal it is probable that Ohio led all the rest. MacGregor in his *Progress of America*, published in 1847 (Vol. II., p. 747), quotes a Mr. Scott of that state, as writing that "Ohio has great natural facilities for trade in her lake and river coasts; the former having become available only since the opening

¹⁰Report of the Committee, p. 24. (Forty-third Congress, first session).

¹¹The discussion of the River and Harbor bill of 1905 in the National House of Representatives—extracts from which are published in connection with the argument for Federal improvement of the upper Hudson on pages 54 and 55 of the State Engineer's report for 1905—throws a side-light upon the opinion of statesmen from widely different parts of the country in regard to the purposes which the Erie canal still subserves and the lasting benefits it has conferred upon the country.

of the Erie canal, in 1826,* and that to little purpose before 1830." Table No. 3 verifies that fact. Again, that the effect of the canal was not lost on Ohio, but rather obscured by the contemporaneous emigration westward, is indicated by the exhibition of table No. 5, showing the unique growth of the new town of Cleveland, on the lake shore, during the decade 1830-40. Equally remarkable was the growth of Detroit, shown in table No. 6. The unparalleled stimulation of the new and the old alike, where peculiarly sensitive to its effects, thus bespeaks conclusively the influence of the canal. To appreciate the benefit derived by the inland states from the facilities afforded by the great waterway, it is necessary to reflect that, in the early decades of the century, no better thoroughfare than the incomplete National road existed for the transportation of goods between the northwestern states and the seaboard and that for a quarter century thereafter (1825 to 1851), or until the opening of the Erie railroad, the canal furnished the only practicable means for through communication, other than the batteau and the Conestoga wagon, or at best the stage-coach and Durham boat.¹² If any statement is necessary to demon-

* So in original.

¹²Railroads connected Albany with Buffalo as early as 1842, but were then under ten different systems of management, necessitated transfers and did not properly constitute a through line.

The following description from the writings of a contemporary lake captain clearly presents the difficulties of westward transportation. "From 1817 to the opening of the Erie Canal in 1825, most sail craft were obliged to lay up during two months or more in summer for the want of sufficient up-freight to keep them in commission, down cargoes at that date being very limited, confined mostly to a few furs and peltries, a small quantity of Indian sugar and white fish, the only exports from the West. Most of the merchandise from New York, bound westward, was transported by Durham boats, or batteaux, up the Mohawk River, through the Utica and Rome Canal, down Wood Creek, across the Oneida Lake, down the Oneida, Seneca and Oswego rivers, round the portage at Oswego falls, thence across Lake Ontario to Lewiston, up Lewiston heights by portage, round Niagara Falls, with the slow process of teams to Schlosser's landing (then called Fort Schlosser), then taken in batteaux or Durham boats to Black Rock harbor. . . . Some merchandise, however, found its transit from Albany to the lakes, by the tardy way of wagons drawn by six or eight-horse teams to this port. Vessels were often detained one or two weeks after they commenced taking in their lading waiting the arrival of those teams for sufficient goods to complete their cargo. In the meantime they could, as a general thing, learn by the arrival of the stage coach that came daily with the mail (unless prevented by bad roads), what time they passed the freight wagons and the time those big teams might be expected to arrive at Buffalo or Black Rock. Those slow, but formidable establishments, were commonly called Pennsylvania teams. . . . But when the Erie Canal between Buffalo and the Hudson River was opened through valley and mountain, connecting the great chain of lakes with the ocean, a new impulse was given to our city and trade." (*Buffalo Historical Society, Publications*, 1902, Vol. V, pp. 304-305, from records of Captain Augustus Walker, published under the title, *Early Days on the Lakes*.)

Another excerpt portrays the displacement of the old by the new conditions and we shall have occasion to refer to it in illustrating the discussion on that subject. "On the stage route [between Albany and Buffalo], as many as twenty to thirty of these teams [Pennsylvania or 'Conestoga' wagons] would be seen in a day. Taverns for their accommodation,

strate the large service of the canal to the Northwest and pre-eminently, perhaps, to Ohio and Michigan, it is but necessary to cite table No. 3, which shows the relative extent to which the several states used this waterway for transportation purposes, and again table No. 4, exhibiting the remarkable growth of the proportion of out-of-state products passed upon the canal, these products being in 1836 the merest fraction and in later years the predominant share of the total movements. That in itself is a tribute in the highest degree to the part borne by the waterway and the need which it supplied in the evolution of the West.

The facts of history are always more graphic from the lips or pen of a contemporary. As touching the subject in hand we submit, therefore, the following statements from the early historian of the Mississippi valley. "Ohio," he says, "with the largest and most dense population of any of the western states, has nearly double the number of inhabitants, by the census of 1830 which she had by that of 1820.—During that interval, her gain by immigration has scarcely equalled her loss by emigration; and, of course, is simply that of natural increase. In the rapidity of this increase we believe that this state not only exceeds any other in the West, but in the world."¹³

Of an adjoining state the same historian writes: "In consequence of the great change produced by the opening of the New York canal, and the canal connecting Lake Erie with Ontario, the north front of Indiana along Lake Michigan, which, a few years since, was regarded as a kind of terminating point of habitancy in the desert, has begun to be viewed as a maritime shore, and the most important front of the state."¹⁴ To what extent the canal facilitated such an increase may be understood when it is remembered that "the universality and cheapness of steam

with large barns and sheds, were established every twelve or fifteen miles along the route; which, of themselves, made quite a formidable village appearance. All these, with the large outlay of wagons, became dead property on the opening of the Erie Canal; the decaying remains of many of them are yet to be seen along the old stage route to Albany.

"The canal soon drew to it all the active business. The villages on the old route were deserted by the most enterprising, and new villages started up along the canal. The portage, and warehouses connected with it, became worthless." *Early Transportation in New York State*, by Col. William A. Bird in *Publications of the Buffalo Historical Society*, Vol. II, p. 25. (1866.)

¹³*The History and Geography of the Mississippi Valley*, by Timothy Flint, Vol. I, p. 130 (1832.)

¹⁴*Id.* p. 382.

boat and canal passage and transport, have caused, that more than half the whole number of emigrants . . . and nine-tenths of those that come from Europe and the northern states, . . . now arrive in the west by water"; and again that "perhaps more than half the northern immigrants arrive at present by way of the New York canal and Lake Erie." Why the immigrants prefer water transit is further explained by the same contemporaneous historian: "They thus escape," he says, "much of the expense, slowness, inconvenience and danger of the ancient cumbrous and tiresome journey in wagons. They no longer experience the former vexations of incessant altercations with landlords, mutual charges of dishonesty, discomfort from new modes of speech and reckoning money, from breaking down carriages and wearing out horses."¹⁵

Most of us are somewhat familiar with the trials of travel by stage-coach in the olden time, if only through the vigorous Pickwickian pictures drawn by so many masters of English fiction. Yet it is probably difficult for us to picture adequately the extremity of discomfort and privation endured by late seventeenth or early eighteenth century travelers in what was then our frontier territory. And although the benefit derived from the canal through its packet lines is hardly to be compared with its service in connection with the transportation of freight and produce, yet the bare fact that it reduced the time required to make the trip between New York and Buffalo from six weeks to ten days¹⁶ is sufficient to excite some comprehension of the magnitude of that benefit and the stimulus it afforded to the development of the West.

But when we consider the benefits accruing to merchants, producers and consumers, through the cheapening of rates and the enlargement of the market, we undertake a subject of large proportions. The trials which beset the immigrant in journeying to the West were small in comparison with the difficulty of estab-

¹⁵*The History and Geography of the Mississippi Valley*, Timothy Flint, Vol. I, pp. 184-185.

Descriptions of travel along the canal via packet have been preserved to us by Horace Greeley in his *Recollections of a Busy Life* and by Fanny Kemble in her published *Journal*. (See extract *American History Told by Contemporaries*, edited by Albert Bushnell Hart, Vol. III, p. 566.)

See also *History of Transportation Systems in the United States*, p. 50, and *My First Journey to Michigan*, by John F. Hinman in *Michigan Pioneer and Historical Collections*, Vol. XIV, p. 563. (1889.)

¹⁶See *A Short History of the State of New York*, by Anderson and Flick, p. 149.

lishing himself, when once on the spot, of obtaining a livelihood and providing for his family some small measure of those comforts which all classes enjoyed in the East. The canal aided him in emigrating, but it encouraged him far more, when it enabled him to ship his grain and flour from Buffalo to New York markets for about twelve dollars, whereas before it had cost him a hundred dollars per ton;¹⁷ and when, through the medium of that transporting agency, he was able to buy the merchandise and manufactured products of the eastern country at prices not greatly different from those which prevailed along the coast.

The rapidity with which prices of local products rose on the completion of the Erie canal and allied systems, and how far their united influence penetrated, is evident from the subjoined table, showing prices in Cincinnati, invigorated by the extension of the market and the consequent increase of demand. If the western producer was able to double his price on flour and nearly triple that on corn, it meant that his profits were enhanced many times, and this at a point, too, from which navigation had always existed,—through to the Mississippi and the Gulf.

TABLE OF PRICES AT CINCINNATI.¹⁸

	1826.	1835.	1853.	1860.
Flour per bbl.....	\$3.00	\$6.00	\$5.50	\$5.60
Corn per bush.....	0.12	0.32	0.37	0.48
Hogs per cwt.....	2.00	3.12	4.00	6.20
Lard per lb.....	0.05	0.08	0.08½	0.11

The effect of an improvement in the transportation facilities of a new country is always felt directly in the rates of transportation and prices of commodities, but the ultimate result, of which that is merely a promise, consists in the consequent development of the region served. The influence of any great work of intercommunication on the prices of commodities and rates of shipment cannot fail to be interesting and suggestive and to identify that work as the responsible agent and benefactor. But the real measure of its accomplishments is rather in the extent to which

¹⁷See testimony of Geo. S. Hazard before the Select Committee on Transportation Routes to the Seaboard; also, *Transportation Systems in the United States*, p. 261.

¹⁸This table is taken from *Transportation Systems in the United States*, p. 155.

it opened and developed the interior. Therefore we proceed to a study of population and the varied growth of the territory under the influence of the canal.

As a subject for more detailed treatment, let us consider the situation in the State of Michigan during the period after the opening of the Erie canal in 1825. Turning again to table No. 2, it will be observed that this state occupies the first place among all the states of the Union in point of increase during each of the two decades from 1820 to 1840; that its percentage-increase in the second decade is more than double that in the first and exceeds the maximum percentage-increase found anywhere during the previous decades discussed.¹⁹ From this circumstance and the known fact that the population had been increasing slowly in earlier years it would be inferred that the rapid rate of increase began about the middle of the decade 1820 to 1830 and was exceptionally large, as compared with that of other new and developing regions.

Reference to table No. 6 also has impressed us with the astounding growth of Detroit, far greater during the period from 1830 to 1840 than at any other time. It serves to strengthen the conclusions already drawn and to verify also the following forcible statements from a reliable, local source in regard to the influx of population into this state and its metropolis during the period in question:

"Fifteen thousand emigrants arrived in 1830. . . . The [Detroit] Free Press of May 19, 1831, said: 'To say nothing of those who have arrived by land, and through Lake Erie by sail vessel, the following steamboats arrived here within the last week . . . [with passengers] amounting to more than 2,000, and nearly all in the prime of life.' . . . Such was the tide of immigration during the entire season of navigation that both steam and sail vessels were crowded to their utmost capacity. On October 7, 1834, four steamboats brought nearly 900 passengers. In January, 1836, three steamboats—two first class and one second class—arrived each day, with an average of 260 passengers each way. On May 23, 1836, 700 passengers arrived,

¹⁹It is a fact, to be sure, that the upper peninsula was not annexed until Michigan was admitted to statehood in 1837, although this annexation probably increased the total population very little.

and during the month there were ninety steamboat arrivals, each boat loaded with passengers. The roads to the interior were literally thronged with wagons. A careful estimate made in June by a citizen showed that one wagon left the city every five minutes during the twelve hours of daylight. In 1837 the immigration was fully as large; there was an average of three steamboats a day, with from 200 to 300 passengers each, and on one occasion in the month of May, 2,400 passengers landed in a single day. The larger part of these immigrants were from New York, and the rest mostly from New England. It is probable that, in proportion to its population, Detroit, and in fact the entire State of Michigan, has a larger percentage of New York and New England people than any other western city or state."²⁰

Speaking of Detroit the same writer says: "No considerable number of Irish were here prior to 1833, but at that time numbers of them came. The Germans began coming in the spring of 1832"; and again he cites the statistics of nativity of the census of 1880 and asserts that, of those states contributing to the population, "New York heads the list with 7,722, Ohio sent 1,965, Pennsylvania 998, Massachusetts 922, and Illinois 568. Out of a total of 116,340 there were born in America 70,695."

The same historian alludes to the "emigration fever" and then reprints an effusion, much circulated, as he says, in that day, "known to have been largely influential in promoting emigration," and containing the following lines, which, if they do little credit to the versification inspired by the achievement of our Clintons and our Wrights, yet echo the extensive spread of its influence:

"Then there's the State of New York, where some are very rich;
Themselves and a few others have dug a mighty ditch,
To render it more easy for us to find the way,
And sail upon the waters to Michigania,—
Yea, yea, yea, to Michigania."²¹

When we consider the isolated condition of this peninsula-state, jutting northward among the lakes and remote from the grand routes of inland travel, and at the same time the wonderful

²⁰*History of Detroit and Michigan*, by Silas Farmer, pp. 335-336. (1889.)

²¹*Id.* pp. 335-336.

accessibility of its territory to navigation on these lakes and thence by the cheapest route which Nature had furnished or man could possibly contrive, and extending through to the seaboard, except for three hundred and fifty miles across the state of New York—apprehending these conditions, we are forced to conclude that the removal of this solitary obstacle to through traffic by water, accomplished in the opening of the Erie canal, accounts for no small proportion of the simultaneous renewal of growth which occurred in Michigan. The history of the epoch, in a single sentence, we quote from an encyclopedic sketch: "The completion of the Erie canal in 1825 opened a new route to Michigan; and population increased rapidly."²² This is a simple statement of cause and effect, but it is for that very reason a striking epitome of the influence of the canal upon the northwestern country.

A GENERAL DISCUSSION OF THE EFFECT OF THE CANAL UPON NEW YORK STATE AND CITY.

We pass now to a consideration of the influence of the canal from the more restricted point of view of the self-interest of the State of New York. As we survey this field, there appears another notable source of competition, which was possibly anticipated and averted by the construction of the Erie canal. The State of New York, indeed, possessed natural advantages superior to those of any other Atlantic state, as a route of communication from the inland district to the seaboard. New York is today the only state extending from the ocean through the country to Canada, touching the lakes, and tapping the great productive inland region of the Middle West.

In colonial times there were four primary routes of travel across the Appalachian system in the North, following, each one of them, an ancient Indian trail. The early settlers might penetrate to the interior by way of the Cumberland Gap, or Tennessee valley, to the southward; or they might cross southern Pennsylvania to the Monongahela river and thence to the Ohio; following up the Hudson and Mohawk rivers it was possible to strike across from the head waters of the latter to the Allegheny; or finally

²²*Encyclopedia Americana*, article on "Michigan."

there was open to them, after the strongly entrenched Indians of the Iroquois nation had been pacified, a fourth route, keeping west from the upper waters of the Mohawk, crossing the famous "Oneida" portage and thence on towards the lake at Fort Oswego, or away through the tribal lands of the Onondagas and Senecas and Cayugas to the Niagara river. The most southerly of these routes had figured prominently at first in the settlement of the Ohio valley. Braddock's road and the Cumberland road, however, had been laid out across the mountains by way of the second route and had thus attracted later the principal intercourse. But, as an authoritative writer states, "of all the routes by which the Appalachian barrier could be crossed, the most favorable in the north was by way of the Hudson and Mohawk valleys to the lakes."²³ In addition to being the best natural route, with least height of land to be overcome, it had the advantage of a connection with a harbor and port unequalled for natural facilities throughout the whole extent of the coast, where Nature had, by glacial agencies, sunk the mouth of a broad and navigable channel to a remarkable depth. New York was thus in a real sense the natural key to the interior.

There were, however, on foot in the last days of the eighteenth century projects much advocated, and emanating, in one case at least, from General Washington himself, which proposed to connect the head of Chesapeake or Delaware bay or the Potomac river with the Ohio and the lakes.²⁴ Nothing but the difficulty of overcoming the intervening high land deferred the construction of such a canal in that favored climate; but had the utilization of the advantages peculiar to New York been less prompt, it seems probable that the inducement offered would have been ultimately sufficient to effect its construction—much as the recent indifference of Liverpool in regard to her commercial interests induced the construction of the Manchester ship canal, and transferred to Manchester part of that monopoly which had been vested in Liverpool by Nature. Once built, a more southerly canal from the Ohio system to the seaboard might indeed have swept away our prospective commercial glory, the joint product of our unique

²³See *Basis of American History*, Livingston Farrand, Vol. II, p. 30. (1904.)

²⁴See sketch of the Chesapeake and Ohio canal in this book.

opportunities and our energetic, far-sighted policy of administration.

This possibility assumes some degree of practical importance when we but consider that "heroic efforts were made [by Pennsylvanians] after the construction of the Erie canal to hold or capture their share of the internal trade. Every effort was made to link Lake Erie with the Ohio system and then with Philadelphia. Indeed, a great debt which for years after weighed heavily on Pennsylvania was contracted in the attempt."²⁵ The Legislature was memorialized, public meetings were held and a "Society for Promoting Industrial Improvements" was formed. Railroads and canals were compared and discussed and in 1825 an address appeared, in which "it was said that in 1796 the aggregate exports of Philadelphia were forty per cent more than those of New York; whereas now they are forty-five per cent less. The difference was to be ascribed to the facilities for transportation afforded by the canals of New York."²⁶ With such enthusiasm prevailing it seems not at all impossible that Pennsylvania, had it not been for the Erie canal, would have succeeded ultimately in overcoming natural difficulties and piercing the mountain barrier in season to secure for herself and her metropolis the commercial prestige which the canal in reality captured for New York State.

In broaching the question of local benefits we have been led to a consideration of a phase of our subject more favorable for direct statistical treatment than that which has been already discussed, for, while the United States, had it been divested of the liberal benefits which it derived from all its internal waterways, would still undoubtedly have advanced to its conspicuous place among the nations of the earth, on the other hand, without the Erie canal, it is reasonably certain that New

²⁵*History of Philadelphia*, by Scharf and Westcott, p. 610. (1884.)

From another source we extract the following: "In 1791, in an account of the Ontario country, published in Philadelphia, the writer says: 'It is in contemplation at present, to make a water communication between the Susquehanna and the Schuylkill, which, if effected, will lay open the market of Philadelphia for the reception of the produce of all the Genesee country.'" (*Early Transportation*, by Col. William A. Bird (1886), in *Publications of the Buffalo Historical Society*, Vol. I, p. 19.)

Among numerous projects for establishing navigation through to the interior, the proposition to connect the James and Great Kanawha rivers has long been a favorite both with the Government and with private companies. For results of Government investigations of this route see Chief of Engineers' Report for 1877, Appendix V.

²⁶*Id.* 'p.'612.

York State would not have risen by such gigantic strides from the secondary position, which it occupied in early times, to the attainment of that prominence among the states of the Union, from which it has never since been dislodged.

To illustrate further this relative growth of our home state, we may refer to the statistics prepared for New York in table No. 21, *et seq.*, and represented among the curves in the diagram of plate No. II, which will be discussed more at length in subsequent pages of the chapter. A glance at this table or diagram will suffice to convince the reader of the pronounced impetus to growth imparted in the period from 1814 to 1820, at the beginning of which period our State passed the one million mark in population. It may be assumed as a fact, therefore, that there existed some cause for acceleration of development at about this juncture—a cause which must have been, in the light of the history of the time, either a reaction from the War of 1812, acting from without the state, or else the construction of the Erie canal, which was the distinguishing domestic occurrence of the period. Now the far-reaching effects of the War of 1812 were national in their scope and would be expected to influence the several states alike, while the direct benefits of the Erie canal were largely confined to New York and the Middle West. The figures of table No. 7 show that, compared with the other six seaboard states, the growth of New York in the period of 1820 to 1840 was unparalleled. Table No. 8 exhibits the progress of the thirteen original states, and illustrates the fact that the percentage which these states contained of the total population of the United States diminished from census to census after 1800 with the exceptions only of New York and Georgia.

It may be objected that figures somewhat disguise the proper relationship between New York State and the original states, since, unlike some of them, New York possessed or acquired a large undeveloped territory in addition to her sea and river front, the growth of which portion would be more fittingly comparable with that of the newer states. This does not, indeed, affect the comparison of New York with such of the original thirteen as Pennsylvania, Virginia and the Carolinas. Moreover, it is apparent from the studies outlined by table No. 19, that the density of population of the western section of the state exceeded that of each of

the northwestern states even as late as 1840, while in 1820 western New York was very much more densely populated than Ohio, the earliest settled state of the Northwest, thus indicating that in their development our western tracts were considerably in advance, chronologically, of Ohio and the entire northwestern group. As the normal rate of gain of a region rapidly decreases with its increasing density, the comparison between western New York and any of the northwestern states during this period might be presumed to prove very unfavorable to New York. Yet, actually, the western counties bordering on the canal (Division III in the table) increased 55 per cent from 1820 to 1830 with a density of population of 33 per square mile at the beginning of that period, while the State of Ohio increased but 61 per cent with an initial density of only 14 per square mile.

Notwithstanding its considerable density in 1820, New York State, as we have seen, nearly doubled its population in the twenty years ensuing. If compared with the principal example of a new and rapidly developing state in the East, namely, the State of Maine, it will be found that New York's rapidity of increase for each decade is always somewhat and generally far superior. These and kindred studies thus indicate the relatively rapid growth of New York and only tend to confirm the conclusions which we have already drawn from previous investigations.

Again, since the metropolis, the City of New York, bears so conspicuous a ratio to the state, its progress is intimately associated with the state's progress; and as the great distributing point, fed by the canals, it is likewise peculiarly a subject for the exhibition of the fruitful results of canal activity. In order to show the importance of the metropolis to the State of New York at the present time, let us consider what would be left, were the state to be deprived of that city. In the first place we should have practically no seaport and, therefore, no exports nor imports nor coastwise trade, in all of which particulars we far surpass other states, and which constitute a source of immense wealth. We might portray New York under those conditions as a comparatively small, inland state, covering an area less than twenty per cent that of Texas, deprived of three and one-half billions of assessable property, out of a total of less than six billions, and of more than three million inhabitants, out of its total population

of a little over seven millions. There is nothing imperial in this picture, except to the mind of a cynic.

The progress of the City of New York, therefore, has been of vital consequence to the state in proportion as that city is now its mainstay. Yet in 1820 the present bounds of "Greater" New York contained less than ten per cent of the population of the state. In the early days there was not as much business conducted at our port as at other Atlantic ports. Table No. 9, while it exhibits the far greater increase of that city than of any of the other three great competitive seaports in the twenty-year period from 1820 to 1840, also reveals the fact that in the preceding double decade New York was not the most rapidly increasing of the four, while as late as 1820 it was surpassed in population by Philadelphia (accepting the present boundaries of Philadelphia, which are identical with those of the county of the same name), and did not become in reality the metropolis of America until after the canal had wielded its influence and contributed its quota.

The fact is, as we have said, that our great commercial city had been, previous to that time, among the more backward of the colonial ports. There came, however, an improvement. The facilities of the harbor of the metropolis and of the great and navigable Hudson river began to induce trade. So New York increased in the last half decade of the eighteenth century and the first few years of the nineteenth to a more conspicuous rank. Nevertheless, from about that date its export trade wavered, fell and did not recover its former proportions until some twenty years afterwards, or about 1825. During this interval, as the accumulated evidence of population and commercial statistics attests, there seems to have been something of a critical period experienced, as if the prize of supremacy were being held in abeyance. There was apparently a moderate retardation of growth and an awaiting of developments. Perhaps figures are misinterpreted or their bearing on the case exaggerated, but further details, to be presented later, certainly indicate that this unsettled condition existed.²⁷

²⁷See p. 187 of *Statistical View of the United States* (1854), a compendium of the *Seventh Census* for more detailed figures than given by the tables in this chapter.

Suffice it to say now that, corresponding with this period of stagnation, there was taking place, as every historian knows, a fundamental change in the character of our commerce. Table No. 11 gives an exhibit of the shipping per capita engaged in foreign trade for a succession of years and shows that a maximum was attained early in the century, which was followed by a decline, continuing until the present time. Figures from the same source, giving the proportion of American carriage in foreign trade for exports, show in 1826 practically ninety per cent, or more than in a long time previously, but more also than from that year to the present day. The carrying trade of the world, which had been almost a monopoly and the source of so much profit to American seamen, especially during the European wars, was rapidly passing from our grasp. It was then that many thrifty ports which it had nourished, such as those along the New England coast—Newburyport, Salem and Portsmouth—became largely decadent. It was a period of changes and of new developments; for, as the foreign trade diminished, the coastwise trade began to increase, and, more auspicious than all else, at this juncture the internal trade of the nation had its birth, came rapidly to the forefront and grew to be a most important element in the wealth, comfort and community of interests of the several states. Thus the particular advantages, which once made cities and seaports, shrank into relative insignificance. Conditions were reversed. It was as though Commerce had abandoned her old haunts and sought new ones and especially a site for a great metropolis, the requisites for that site being an ample harbor and a direct connection, by some sort of "Northwest Passage," with the interior. Thus the introduction of new ruling elements into the commercial problem, and especially the rise of the internal trade in conjunction with the opportune building of the Erie canal, made New York City the commercial capital of the nation.

So great is the prominence of the change which we have thus depicted, that historians distinguish the year 1820 as the beginning of a new and glorious epoch in the annals of the City of New York. And they set down, as the great opening event, the building of the Erie canal and its early operation, accompanied by the increase of commerce, the influx of aliens and—not the least of them all—the spread of democracy, first manifested in

the metropolis through the demand for the convention of 1822 and the sweeping extension of the suffrage.²⁸

If further corroboration of the commercial changes which we have outlined were necessary, the evidence is not lacking, even from sources least disposed to exaggerate the glory of New York and the beneficence of her institutions. There was one famous rival port situated somewhat similarly in the middle states, liberally endowed by Nature and possessing prospects no less illustrious than those of our metropolis—probably far more promising in the eyes of our forefathers, the colonists—and this city the one which, as we have already said, had a population at the beginning of canal times (present boundaries considered) exceeding that of our own seaboard city. Yet today the one port, New York, has a population of three and one-half millions and combined exports and imports valued at nearly a billion and a quarter of dollars; the other, Philadelphia, has little more than one-third that population and one-tenth the combined export and import trade.²⁹

The historian of the City of Philadelphia, writing in the light of more than half a century of subsequent developments, focuses all of that light in one emphatic statement which, being like a forced confession rather than a voluntary tribute, possesses more than ordinary significance. "Be the cause whatever it may," he says, "the fact stands out prominent that from the completion of the Erie Canal New York became what Philadelphia had previously been,—the commercial emporium of the United States."³⁰ Other writers confirm this view.

This same historian further develops the subject as follows: "The decline of the foreign commerce of Philadelphia was made the subject of a series of letters in 1851 by Job R. Tyson to William Peter, Her Britannic Majesty's Consul for Pennsylvania. In

²⁸See *Historic Towns—New York*, by Theodore Roosevelt; chapter treating of period 1820–1860. See also *The Memorial History of the City of New York*, edited by James Grant Wilson (1893); chapter on the period 1825–1837, entitled, *The Beginning of New York's Commercial Greatness*.

²⁹Data from *World's Almanac*:

New York, population in 1900; 3,437,202.⁷
 exports (customs district) in 1905; \$524,726,005.
 imports (" ") in 1905; \$679,629,256.

Philadelphia, population in 1900; 1,293,697.
 exports (customs district) in 1905; \$63,278,070.
 imports (" ") in 1905; 60,180,901.

³⁰*History of Philadelphia*, Scharf and Westcott, p. 2220. (1884.)

these letters the causes of that decline were examined and the means of reviving it discussed. Mr. Tyson reviewed the past, examined the present, and forecasted the future. The fact that New York had stepped in between Philadelphia and her foreign commerce and drawn the same away could not be denied, but the former position of pre-eminence might, in Mr. Tyson's opinion, be recovered by the exhibition of more 'pluck and energy,' on the part of Philadelphia merchants. 'The merchants of 1851,' he said, 'have only to echo the sentiments of one of the non-importation resolutions of 1765 as steadfastly as they were uttered and observed by their fathers, the merchants and traders of the city of Philadelphia do unanimously agree, and the work is done'. It is not within the power of individual, corporate, municipal, or State resolution to command the circumstances that make up the commerce of any port. It is not upon every fine harbor or navigable river that the marts of commerce are to be found. There are innumerable elements which, combined, fix and determine whether commerce will grow and prosper, without regard to the unanimous resolutions of merchants, or any other part of the population. The Erie Canal poured into New York the vast productions of the Northwest, and thirty years ago one city was equal to their distribution. New York and not Philadelphia reaped the benefit of that trade. The revolutions which the last thirty years have made in the material wealth of the great Northwest, the West, the Southwest, and the South, no longer put it within the capacity of any one city on the seaboard to distribute the thousands of millions of dollars worth of products raised annually by the trans-Alleghany section of the country. Philadelphia has regained very much and will regain much more of her ancient commerce, as transportation is cheapened and the products of the country are delivered at her wharves at the same or less cost than at New York. The common reason given why the trade of the country seeks New York is because New York has more capital than any other American seaport. But money or capital is only a convenient medium of exchange and is attracted by the product which is the real value. Nor has it any more power to draw the product to it than the eagle has to draw the carcass. Money gathers at New York because the products are there, and the products go there because it is cheaper to carry

them there than to Philadelphia. Transportation is king. Neither cotton, iron, coal or any other product is sovereign. The conditions that fix the cost of transportation to market fix the amount and value of the products and their place in the commerce of the country."³¹

Obviously this phenomenon, the decline of Philadelphia and the rise of New York, was recognized in early years, but the cause seems to have been misconstrued and the historian well says: "It is not within the power of . . . resolution to command the circumstances that make up the commerce of any port. . . . Nor has it [money or capital] any more power to draw the product to it than the eagle has to draw the carcass." Again, "The Erie Canal poured into New York the vast productions of the Northwest. . . . Money gathers at New York because the products are there. . . . Transportation is king."

This very comprehensive work, from which we have just quoted, exhibits the large foreign trade in Philadelphia in years previous to 1830, which exhibit concludes with the words, "Enough is shown, however, to indicate the great loss Philadelphia has sustained in her commercial interests."³² By 1830 or earlier this foreign trade of the port of Philadelphia had practically disappeared. Meanwhile, with a terminus in New York, the first line of regular packets crossing the Atlantic between Europe and America had been established, and by 1838 the business had risen to proportions indicated in the following statement:

STATEMENT OF THE REGULAR PACKETS FROM NEW YORK TO
FOREIGN PORTS IN 1838.³³

To Liverpool, 5 times in each month.....	20 packets
To London, 3 times in each month.....	12 packets
To Havre, 4 times in each month.....	15 packets
To Liverpool and Belfast.....	4 packets
To Greenock	3 packets
To Carthage, Havana and Vera Cruz.....	5 packets
<hr/> Total	<hr/> 59 packets

³¹*History of Philadelphia*, Scharf and Westcott, p. 2222.

³²*Id.* pp. 2214-15. See also foot-note, p. 2220.

³³Taken from a paper entitled *Statistics of the City of New York*, by C. B. Fripp, Esq., and published in the Proceedings of the Bristol Historical Society for 1838.

By assurance of a return freight the transatlantic lines had been attracted from Philadelphia, and no doubt from other ports, to New York City and thus, as we have seen, the facilities for internal trade had come to govern very largely the entire commercial status.

That the supremacy of New York in its facilities for communication with the interior was the nucleus of its supremacy in a far broader sense, may be gathered first from the story of the foreign trade, which we have just rehearsed, and again from the interesting history of the manufacturing industry in the metropolis. Upon the development of manufactures we shall touch in a later section of the chapter, but, as an instance of the remarkable correlation of business interests of diverse character, we cannot refrain from pursuing further the comparison of the two cities—the one on the Delaware, which, despairing of the retention of a commercial primacy, devoted herself to manufacturing industry with brilliant success for a time, and the other at the mouth of the Hudson, bent upon commercial prowess, yet not only becoming the mistress of the seas, but gradually, inadvertently almost, attaining the first rank in the land in the value of her manufactured products. In this study we have recourse again to a Philadelphia publication, a pamphlet entitled, *Philadelphia as a Manufacturing City, a Report presented to the City Councils of Philadelphia by the Philadelphia Commercial Museum*, and published in 1899, from which one of our tables already considered has been taken. We quote from this publication (p. 25): “It is within the memory even of the present generation that Philadelphia was the great manufacturing city of the New World. Every writer and speaker of the first rank so described the Quaker City to preceding generations. . . . On the other hand, New York City made small claim to manufacturing pre-eminence in other days. That city was the premier of foreign trade, a great distributing and financial center. It lacked cheap fuel, was poor in skilled labor, and even in the matter of unskilled labor ranked below many American cities of less pretension. But New York wooed and won the merchant marine of the world; and the blessings of low freights, the facility to handle the largest tonnage, soon began to draw to the city of New York such great manufacturing interests as worked on close margin and were forced to

ship at the lowest possible cost." The same publication proceeds by a review of statistics to demonstrate the fact that New York has indisputably "moved to the front rank as a manufacturing city" and has, in 1898, three times as many industries, with total valuation of products nearly twice as great as Philadelphia. It is because of this chain of numberless benefits, which followed the years of hesitation and uncertainty just prior to 1820, that we are forced to give a large measure of credit to the Erie canal, whose influence secured, or at the very least preserved to New York her supremacy during a critical period of her history and laid the foundation for the structure which succeeding decades have built into the second city of the world.

But, of all the rivals which New York State and its metropolis met upon the sea and had to subdue, none put forth more strenuous efforts to secure the mastery than New England, or more particularly the maritime State of Massachusetts. In table No. 12 we have in juxtaposition the figures for the value of exports in these two states, New York and Massachusetts, which may be regarded as principal competitors for the export trade of the nation.³⁴ While intervening figures show considerable fluctuations, those chosen appear to be fairly representative. It will be seen that in 1811 the two states were substantially on a par in this respect. New York then displayed a tendency to rise, which was curtailed by the war—a circumstance perhaps the outcome of her more marked suspension of business during the campaign and reflecting an accumulation of produce held in the country during war times until more favorable opportunity for exportation should arise.

At all events, a steady decline from 1816 is shown by this table, No. 12, so that in 1821 Massachusetts still tenaciously rivaled New York in the value of her exportations. Had such a condition lasted until the extraordinary development of manufacturing, which swept over the New England states about a decade later, this commercial rivalry might still have continued to threaten the supremacy of the Empire State. As it was, upon the most rational basis of comparison, employed in table No. 19 and on plate No. V, Massachusetts, alone of all the states east and south of the old "North-

³⁴Strikingly illustrated by plate No. I (lower diagram).

west Territory," surpassed New York in growth during the double decade from 1820 to 1840. However, the underlying forces at work—the disappearance of money scarcity and war prices and more than all else, internal improvements, of which the Erie canal was chief—brought about a revulsion of commercial conditions after 1821 and the decline in export values was followed by a general increase rendering New York speedily the first exporting state in the Union, with exports for the year 1841 valued at about three times those of Massachusetts.

Although statistics of imports previous to 1821 are not available, table No. 13 exhibits the rapidly ascending valuations for subsequent years. From diagrams of plate No. I, plotted to represent the data of table No. 14, it will appear at once that not only values of exports but also property values suffered a setback prior to 1820, attained a minimum about the year 1822, and subsequently, as the table will show, increased—the exports with occasional fluctuations, the property values with scarcely another retardation up to the present day. The correspondence of these records is strengthened from the fact that the decline and rise in property valuation occurs somewhat tardily, as compared with the exports. Since commercial and financial depression are first manifested in the impairment of trade relations and felt last of all in the real estate market, this feature would imply a common causation in the two cases, and mere fluctuation could not be construed to explain the conditions.

MacGregor, in his *Progress of America*,³⁵ avers that the Champlain and Erie canals, from the time of their opening, employed "an amount of inland navigation tonnage larger than that of all the foreign and domestic shipping, entering and departing from the City of New York." In line with this statement the exhibit of table No. 17 illustrates the fact that the value of shipments brought to tide-water on the New York canals was, by 1846, greater than the whole export trade of the state and more than one-half the combined trade of all the principal commercial states of the Union. It points first to the commencement and growth of the canal trade in the twenty years and then to the upbuilding of New York in respect to its export trade during the same twenty

³⁵Vol. II, p. 758.

years, from a position of rivalry to a rank of complete supremacy among the states of the Atlantic seaboard. Table No. 15 is intended to emphasize the fact that during the period with which we are chiefly concerned the value of articles transported on the canals exceeded the imports or exports of the state. A comparison of this table with No. 17 will further establish the fact that the way-traffic—movements which mostly originated within the state, but did not reach tide-water—represented twice the value of the through traffic, or traffic in articles shipped to tide-water. New York had therefore an immense bulk of way traffic which benefited her almost exclusively. She had also in the earlier years the overwhelming share of the through traffic, originating within her borders and contributing to her upbuilding. Down to the year 1847 (see table No. 4) the majority of the through traffic arriving at tide-water still came from the interior of the state; and until 1874 (see table No. 10) a greater tonnage passed over the canals than upon either the New York Central or the Erie railroad, thus illustrating the services and importance of the canals.

The State of New York, up to the year 1882, the time of abolishing tolls, had earned considerably more from the various canals than she had expended upon the entire system (see table among the statistics of Part Two of this history), and even to the close of the fiscal year 1902-3 (approximately the time of beginning the 1,000-ton Barge canal) had expended only \$169,466,410 (without interest), as against receipts amounting to \$144,234,120. The Erie canal, to the year of the abolition of tolls, paid for itself, maintained itself, supplied funds to numerous lateral canals, now abandoned, no one of which was self-supporting, paid a large sum annually to the support of the general State government through a period of about thirty years, and then presented the State with some millions of surplus from its revenues. Thus the State actually realized on its original investment, aside from the long train of benefits, which it derived from the construction of the Erie canal.

There are some general considerations worthy of notice before proceeding to the more intricate study of the effects of the canal upon the economy of New York State. For example, a perusal of table No. 7 shows that the state's population of 1820 had in-

creased in two decades by more than seventy-five per cent; meanwhile (as tables Nos. 23 and 33 indicate) the numbers engaged in *agriculture* had increased even more, those engaged in *manufacturing* had nearly trebled and almost five times as many were employed in commercial pursuits in 1840 as in 1820. In the fifteen years from 1820 to 1835 the *valuation of real property* increased far more rapidly than the *population*, while the *personal property* nearly quadrupled in value during the same time, so that by 1835 the individual in New York State possessed an average property of the assessed value of two hundred and forty-three dollars and of market value doubtless considerably more—and all this, notwithstanding that there was for some time prior to 1821 an absolute and steady decline in property valuation, as already stated.³⁶ In 1820 the *unnaturalized alien population* was scarcely a factor in New York State. As a class it constituted only about one per cent of the total. The change in this respect during the fifteen years to 1835 is remarkable—greater than any other of which we treat. The increase during that time amounted to nearly 450 per cent and in 1835 there averaged nearly four of this class to every ninety-six citizens. The change thus brought about—a change marking the commencement of a tremendous social revolution—furnishes an attractive subject, which we reserve for further investigation.³⁷ The percentage of the total area of the state under cultivation increased a little faster than the population, so that, from less than one-fifth in 1821, almost a third of the entire land and water acreage was returned as *improved land* in 1835.³⁸ In 1810 there were but 66 newspapers published in New York State; in 1840 the number was 302. That is, from one to every 15,000 inhabitants, the proportion had risen in thirty years to one per 8,000 of the population.³⁹ The total productivity of New York in 1840 was 50 per cent greater than that of any other state. Probably in the valuation of its property, certainly in the amount of its import and its export trade, and in its output, severally of manufactur-

³⁶Tables 22, 33 and 35.

³⁷*Id.*

³⁸Tables 22 and 38.

³⁹See *A Statistical View of the United States*, published as a compendium of the Seventh Census, p. 155.

ing, commercial and forest products, it surpassed all others.⁴⁰ From a secondary rank in 1810 it had risen and become pre-eminently the first State in the Union.

From all this it would seem to be evident first, that, however much the War of 1812 and the spirit of the times had done for the State of New York from without, there were at work within the state other causes not possessed by sister states, differentiating its progress from theirs and contributing to elevate it to an exalted rank. In the light of these studies, too, the source to which we must naturally attribute such influences is the greatest work of the period, one which we know to be responsible for so much invigoration,—the Erie canal.

EFFECT ON NEW YORK STATE, CONTINUED—STATISTICAL STUDY.⁴¹

"Since such therefore are the advantages of water-carriage, it is natural that the first improvements of art and industry should be made where this conveniency opens the whole world for a market to the produce of every sort of labor, and that they should always be much later in extending themselves into the inland parts of the country."

Adam Smith in Wealth of Nations.

Introductory.

To a certain extent in order to ascertain by a more specific and perhaps a more convincing research the occasion for such disproportionate growth and prosperity as we have depicted, and no less for the purpose of tracing the influence of the Erie canal in the diversity of its manifestations, an elaborate compilation has been made of the official statistics of the early period, which relate to the towns and counties in our home state and their progress. We may not hope that such a study will demonstrate with mathematical exactness. We may rest assured that it cannot exhaust the subject nor picture all the channels of that influence. Our problem resembles, on the contrary, that of the geographer who seeks to delineate the ocean bed. Were the measurement of every point of its topography essential, generations and even ages would not suffice. But clearly, he may derive a liberal store of information by fathoming here and there, and evidently, too, the knowledge he secures is more or less reliable and his range of in-

⁴⁰See *Progress of the United States, in Population and Wealth in Fifty Years*, by Professor George Tucker, table on p. 195. (1843.)

⁴¹The several divisions and subdivisions are outlined on the map of the state, contained in the appendix to this chapter.

terpretation broader or more contracted according to the frequency of his soundings.

First, we have purposed, by separating the major portion of the state into four main divisions, to adduce a contrast between the sections most susceptible to the effects, for good or ill, of the construction of the Erie canal and those more remote in situation or otherwise presumably less affected by its inception and continuance. We have recognized in New York and Kings counties—the territory comprising our Division I—interests and a history quite distinctive and unlike that of the remainder of the state. The counties of Kings and New York represent the modern city of “Greater” New York, the metropolis, the only notable seaport, and containing at the present day about one-half the population and far more than one-half the assessed valuation of the entire state. Even in 1840 New York county, alone, was larger than any four other counties combined, and in its environment and progress was comparable with no other district or division of territory from the coast to the lakes. This distinction was really vital and extended to the alimentary channels, as it were. The sources of the city’s nourishment and upbuilding were wholly external. But for its daily draught on tributary districts and agricultural communities its manufactories must starve and its commerce disappear. Indeed, only to a limited extent a manufacturing city, its absorbing interest was as a mart for the interchange of the commodities and produce of the world. Generally speaking, its function was to serve. It existed only because of the surplus and needs of other communities. It was, and is, a great distributing center, and as such has been subject to peculiar laws of growth and opportunity for increase in density of population, forbidden to other localities. Not only was it non-agricultural and dependent, but in addition it has come to be widely known as cosmopolitan—a port whose prosperity, unlike that of the rest of the state, has been very largely and directly drawn from national and international sources. New York City responds punctually to each westward impulse of emigration and civilization. The supplies, the capital, the emigrants themselves pass through her portals and deposit their respective contributions in her coffers before proceeding to the interior. Her population in its disproportionate rapidity of increase, as we shall see later, displays this expansive

feature of her composition. But in the earlier part of the last century the story was different. That uniqueness had not yet been acquired. Other cities were rival ports of entry, and the metropolis of the state was not the overwhelming majority of the state in wealth and business prominence. It is thus to avoid confusion of the different phases of the influences of those times as much as possible, and to set in relief the phenomenal growth of New York City that we have selected it for separate treatment as the first division of the state's territory.

A second and a third division, together comprise those counties bordering the Hudson river between Manhattan and the Mohawk, the counties touched by the Erie canal, and in addition Suffolk and Chautauqua. It might be expected that these would present, on account of proximity to improved facilities for navigation, decidedly the most conspicuous example of the benefits derived or the injury suffered. However, as that portion of this strip seaward from the head waters of the Mohawk had been in earlier times opened up and settled more or less extensively through the medium of existing facilities for navigation by way of the portage from Albany to Schenectady, the Oneida-Madison county line has been chosen as a boundary between Divisions II and III and we may regard the entire strip to the east, namely, Division II, as developed sufficiently to have attained a condition of normal growth before the canal era of which we treat. On the other hand we may reasonably look to see the most striking stimulation to settlement and industry exhibited in the third division, Madison to Chautauqua counties, inclusive; for these counties lay along the "frontier" district, as it was familiarly known in the war times of 1812-14, and away from through, navigable watercourses of importance. Thus they were virtually opened to through communication by the new waterway. It is no great exaggeration to say, therefore, that whatever they were in 1840, that the canal made them.

Another class of counties presents itself to our consideration. We have designated it Division IV, and have included within it all the remaining inland counties to the south of the Erie canal, those counties now known as the "southern tier." This section is and has always been chiefly agricultural. We have not treated this division at the same length as the other three divisions, since

the influence of the canal, acting overland, so to speak, or else reflected through mutual interests and common prosperity, is bound to be less striking and more difficult of identification.

In order to probe even further the abundant influences engendered by the commercial stimulus of the period and to ascertain just how far away from the shores of the canal we may trace this effect with reasonable certainty, or how its intensity varies in passing from the margin (where it may be assumed a maximum) back inland, we have established two belts or zones throughout Divisions II and III, the first, or A belt, consisting of the townships actually bounding the canal, and the second, or B belt (geographically two belts on opposite sides of the waterways), of the remainder of the border counties. These two belts we have styled: in the East, Subdivisions II-A and II-B, respectively, and in the West, Subdivisions III-A and III-B, respectively. We have found this separation along the somewhat irregular, civil boundary-lines to be the only practicable means of studying the situation, and even in this we have been obliged to introduce some estimated figures in connection with minor details of the investigation, as, for example, in the statistics for towns which were erected or made over between 1820 and 1840—the limiting dates of our principal investigations. In such cases, however, we have generally included the whole extent of the parent township, where we could thus avoid estimation of data, and have thus treated in Belt A some towns remote from the waterways, and in rare cases have omitted border towns from their proper subdivision. Likewise, in the several main divisions we have been obliged to consider the important changes of county boundaries, and frequently to compile our data independently, from the township figures given in the census reports. These are all available back to 1810, however, and thus scarcely an estimated figure is introduced in treating of the main divisions. But in 1810 the population of the state by townships is not available to us and we are compelled, therefore, to confine ourselves to the summary of that census, thus ignoring a number of civil alterations and rendering the comparisons between this year and subsequent years the least reliable of any—a feature which, however, concerns us only in our study of the *population*.

In the range and scope of our investigations we have been limited only by the amount of information available and by the period of the initial and most distinctive influence of the canal. We have extended our most elaborate study (that of the *population*) back to 1810, when the canal was first seriously projected—in order to catch the rate of growth and the general conditions prevailing before its active intervention—and we have discussed that population in numerous ways, with the aid of the national decennial census and the state censuses of 1814, 1825 and 1835, thus covering the period through the year 1840, at which time the full initial effect of the stimulus had been felt.⁴² The western division had passed the eastern in its journey along the path of progress; and, though the era of unchallenged canal supremacy was not over until about 1850, yet before that time the railroad and telegraph and manifold and diverse interests were to a greater or less degree collaborating to favor and upbuild the community. But the initial influence of the canal—to use a mechanical analogy—imparted a ceaseless motion, and the same force has been acting as a continuous acceleration from that day to this. Whence we have added data from the census of 1900. The increase for the sixty-year period intervening has then been resolved into an average increase for a five-year period, to compare with the other rates shown for five-year periods. In 1821 the first attempt was made in a New York State census to gather statistics other than those of population, and from this census, retained in manuscript in the State Library, we have been able to compile figures for the amount of *improved land* and for the *number of manufactories* of ten different classes, to compare with similar statistics in the State census of 1835.⁴³ From the United States census for 1820 we obtain the numbers of *unnaturalized male aliens*, and corresponding data are again found for 1835 in the State census of that year. From the 1820 census also come the numbers of those engaged in the three principal classes of gainful occupations, and these are compared with similar figures for the Federal census of 1840. The additional columns of our table, representing the *property valuation* in 1820, as compared with 1835, both *real* and *personal*, are abstracted

⁴²See tables Nos. 21, 25 and 27-32.

⁴³See tables Nos. 22-24, 26 and 33-40.

from the special reports of the Comptroller of the State to the Legislature.

Reflection on the subject will suggest that the results of such early enumerations must have been quite defective, and perhaps so ambiguous in classification as to prove nothing in any comparison to be drawn. The assertion is true to a limited extent. Too much reliance may not be placed on the intricacies of such a study, but with the exercise of much care the general observations are seldom vitiated, we believe, and especially where so extensive a range of interest is considered, the danger of ill-founded general conclusions is slight.

There are several notable sources of uncertainty. For example, the figures for the *number of persons engaged in commerce* in 1840 are supplemented by the numbers of those engaged during that year in *navigation* of lakes, rivers, canals and also separately of the ocean, these classifications not being given in the census of 1820. Moreover, the instructions to marshals of the 1820 census do not enlighten us with respect to the exact definition of the term *commerce* as used in that census, while from internal evidence, deduced from details of comparison of the two years, we are reasonably certain that in many cases at least the persons engaged in navigation were included under the head of those engaged in *commerce* in the returns of 1820. Thus the combined figures for persons engaged in *commerce*, plus those engaged in *navigation* for 1840 appear to be comparable with the numbers returned in 1820 of persons engaged in *commerce* only. The increase, however, on the other basis is striking enough, and, as there is no absolutely conclusive evidence in existence, results of comparison on each basis have been given.⁴⁴ Again, some question exists as to whether the figures for unnaturalized aliens used, as obtained from the censuses of 1820 and 1840, are entirely parallel. There are, no doubt, some facilities for further study of the increase of the various sections of the state. There are Federal census returns, for instance, as early as 1810, of the value of manufactured articles. A recapitulation of these data is furnished in the twelfth census, but the details are not available and the returns make little pretension to sufficient accuracy and uniform-

⁴⁴See table No. 23, sixth and seventh columns.

ity for purposes of comparison. There is facility for discussing more in detail the various classes of population recognized by the early census, of ascertaining the proportion at different ages, the ratio of male to female, *et cetera*, but their very slight bearing on the subject seems not to warrant painstaking inquiry. Thus we consider that we have examined the principal and most suggestive basis of comparison available in view of the meagreness of the census at so early a date as 1820. We venture the statement that, if further insight be desired, it will rather be found through increase in the number of divisions of territory than by any other expedient. We are convinced, moreover, that no greater refinement in classification of border lands along the waterways than by counties and townships can be pursued with any approach to a satisfactory accuracy.

In order to study the data accumulated for each section of the state we have made numerous arithmetical deductions. We have throughout obtained the differences in absolute figures for each period representing the actual gain or loss. These have been reduced to percentages of the original figures (tables Nos. 27 and 33), then, in connection with the area, the density of population per square mile has been computed (table No. 28), together with its gains and losses (table No. 29). For the industrial statistics the data have been divided by the population; per capita figures, or oftener figures per one hundred of the population, have been obtained thereby (table No. 35); and losses and gains in this respect have been ascertained (table No. 34). Again, to adduce a significant comparison between the several divisions, each has been treated in its progress and absolute condition relative to the progress and absolute condition of the entire state, figures of which have been, largely for this purpose, compiled; that is, the equivalency of these data in terms of the corresponding data for the state has been found (tables Nos. 30-31 and 36-37). Also the subdivisions have been treated in some such manner with respect to each other or to the main divisions embracing them. In addition, occasional results have been deduced, such as in finding the percentage of the total area of the several divisions actually under cultivation (table No. 38), and the approximation to the average number of acres of improved land to each person engaged in

agriculture (table No. 39)—this latter study involving a severe extrapolation on account of the dissimilarity of periods represented in the data used. In order to investigate and to present results pertinently, the densities of population have been plotted for each census year and curves drawn, which appear on plate No. II.

Thus equipped with the necessary preliminary information for weighing the evidence, we proceed to the consideration of the data accumulated, and first to the study of the population.

*Population.*⁴⁵

Period Treated. 1810-1840-1900

It will be seen from table No. 32 that in 1810 about 10 per cent of the population was in "Greater" New York (Division I) and nearly one-half was in Division II, whence nearly 60 per cent ranged along the Hudson and Mohawk rivers to the Sound, and that there was contained about 16 per cent each, in Divisions III and IV—the whole territory treated comprising 90.4 per cent of the state, though only 34,000 out of 50,000 square miles, or 68 per cent, of its total area. In 1840, however, New York contained about 15 per cent, Division II now less than one-third of the total, while Divisions III and IV still contained about equal percentages—namely, 21 per cent each—although the latter (Division IV) covered almost twice as much territory as the former. There was still nearly one-half the population concentrated along the Hudson and Mohawk rivers. The sections considered now contained 87½ per cent of the state's population, showing that the remainder with 32 per cent of the area was yet a small factor in considering the increase of population, and further that the population of these northern counties, varying about uniformly with that of the state, is consistently eliminated from the discussion. The four divisions considered contain now (1900) 93.6 per cent of the total population of the state.

It is apparent from the curves of plate No. II that generally much the least progressive portion of the period covered was at the start, 1810 to 1814, at which time the several sections appear to receive new inducement to growth. The entire state, also, quite

⁴⁵Tables dealing with this subject are Nos. 21, 25 for data; and 27-32, derived from them. See also plate II and plate IV (upper diagram).

uniformly increasing throughout the remainder of the period, is at this time notably invigorated. This circumstance may be accounted for in two principal ways, as we have observed on previous pages. First, the War of 1812, concluded by the Treaty of Ghent in 1814, had given the country at large a setback. The rate of increase was thus much enhanced immediately following the census of that year. The second reason consists in the internal forces. We have already shown from table No. 7 that all the states had prospered in the reaction from the War of 1812, yet the rate of increase of New York during the double decade 1820 to 1840 was by far the largest, thus indicating the operation of local rather than national forces to a large extent in its upbuilding, and of these local forces principally the internal improvements—chief among them the Erie canal, formally authorized in 1817, and finally completed in 1825.

It will also be observed by reference to the curves that on the final opening of the canal in 1825 an acceleration, though much less pronounced than the first, is yet distinguishable in some instances.

It may be wise to remark here that the percentage-increase normally decreases with increase in population, or density. Even if the population curve is straight—that is, the rate of increase uniform, no matter how steep—this condition is fulfilled. To represent a constant or augmented percentage-increase the population diagram must curve upwards. This means, therefore, that any continued ascending progression of the figures for periodic percentage-increase of a section—or, indeed, the constancy of this figure—implies a rate diagram curving upwards, or an anomalous growth.

Proceeding to the consideration of the four divisions, we find that Division I, substantially New York City, differs in being a distributing point and on the seaboard, influenced thus by different conditions from the producing communities. It is noticeable that just prior to canal times (namely, in 1810–14) its population suffered a decrease of 1.4 per cent—due in part, no doubt, to the War of 1812. This is the only absolute decrease which appears in any of the sections throughout the period treated (that for Division II in the same period being only apparent and due to including in the 1810 figures for Montgomery and Oneida counties re-

turns for the whole or parts of the present Hamilton and Oswego counties), and it is in strong contrast with the phenomenal increase throughout the remainder of the period, or following the impetus furnished by the canal. This division experienced an increase in density of population per square mile from 1810 to 1840 more than seventy times as great as the increase of the state at large. It passed, as we have already shown, the last of its rivals among the ports of the Atlantic coast during this period, increasing more rapidly relatively to the other cities after 1820 than it had done previously, and much faster than it had itself increased in earlier times. Plate No. 1 (upper diagram) illustrates the fact that from 1810 to 1820 New York City was gaining less rapidly than the state at large, from which time it has steadily risen from about 10 per cent to nearly 50 per cent (Richmond and Queens counties are not included in Division I which in 1900 equaled 44 per cent) of the whole state's population.

Regarding population as proportional to business and other growth, its incontestable primacy for the nineteenth century among the cities and marts of the New World was, it would appear, established and secured during this period, as nearly as it can be designated by census years. The foreign commerce of the entire country, together with the merchant marine, diminished greatly in relative magnitude after the War of 1812, but that of New York least of all the states. It thus seems unavoidable to conclude that in the acquisition of the internal trade—the key to coastwise and foreign trade at this period particularly—our metropolis captured the prize which was to become the foundation of her importance. She was henceforth the Gibraltar, controlling for one hundred years at least the resources of the upbuilding West.

Possibly on account of some deficiency in the State census, or overestimation in the Federal census, the population of Division II fluctuates with some regularity, dropping in the middle of each decade. The population remains about stationary from 1810 to 1814. Its rate of increase is manifestly accelerated between 1814 and 1820, simultaneously with the beginnings of the canal; but obviously the draught of the westward emigration reacted upon it between 1820 and 1825, so that the resulting average rate of increase, adhered to with striking uniformity from 1825 to the

present day, is somewhat less than that of the entire state, and accordingly the percentage which it contains of the total population of the state falls from 48 to 30 between 1810 and 1840, while every other division treated contains a greater percentage of the state's population in 1840 than in 1810. Nevertheless, from 1820 to 1840 its population multiplied 1.38 times, thus indicating a more rapid percentage-increase than that of the prosperous State of New Jersey, shown in table No. 7.

Evidently the forces of the day did not develop Division II as much as the remainder of the state. The explanation is found in the fact that the disproportionately rapid growth of the newer sections drew heavily upon the population of the older settlements along the Hudson and Mohawk rivers and thus counteracted the stimulating effects of the canal upon its shores. As these counties had long been open, to a greater or less extent, to navigation from the seaboard by way of the two rivers, the portage from Albany to Schenectady and the improvements of the Western Inland Lock Navigation Company, the canal did not, as in the case of the western counties, so conspicuously facilitate their trade. As they were not directly benefited by the mere through commerce passing on the canal and did not contain terminal or distributing points to any considerable extent, it is apparent that they would not profit from the new waterway in the same manner as did New York City, to the east of them. Unquestionably the canal affected considerably the distribution of the population in local instances throughout this district, as instanced by the loss at Schenectady and the gains at Watervliet and Albany. Doubtless, too, its influence would be more apparent in the counties from the Hudson river west, if treated separately, as that section had borne the additional expense of the portage and the high tolls charged by the Navigation Company. Nevertheless, Division II as a whole remains a comparatively neutral zone, only normally affected by the influence of the canal, which had fostered such an abnormal growth to the eastward and to the westward.

There is one further characteristic of the population curves for Division II (which will be later emphasized), namely, the slight increase of progressive rate at the conclusion of the period, coexistent with the retardation to Division III. Both of these features,

the positive and the negative, are duplicated and thus are confirmed in the discussion of all the respective subdivisions, and possess, therefore, some augmented weight. We withhold this subject, however, for examination in connection with Division III.

The border towns of this division cover slightly less than one-fourth of the total area. It is obvious that the population was well concentrated along these border towns from the beginning of the period, that is, from 1810, in confirmation of which it is only necessary to note that Subdivision II-B, having a density of only about one-half that of II-A in 1810, still continues about four-tenths in 1840. In the thirty years the population of the division had increased some 70 per cent, but even then had only reached about the density of the A belt of the division at the commencement of that period. These border towns, constituting the A belt, exhibit a growth comparatively uniform with the exception of the phenomenal leap at the time of the completion of the canal, or of turning into it the through traffic from the West—an acceleration which partially, but not entirely, relaxed in 1830, so that the growth of the subdivision continued to be somewhat more rapid than by the rate of increase, which obtained before the day of the canal. Had it not been for this acceleration operating after 1825, it is noteworthy that the ratio of densities of subdivisions would have continued 1:2 until the year 1840. The cause of the phenomenon is thus clearly responsible at least for the progress of these towns in so far as it exceeds the rate of progress of the townships back of them. Thus also it may be stated of the eastern border towns, that decidedly the most distinctive feature of their progress was this leap between 1825 and 1830, leaving its impress on the subsequent rate after it had itself expired. So sudden and striking a feature can be attributed to nothing, we surmise, but the opening of the canal in 1825, the benefit of which, it appears from an examination of table No. 25, fell to both the towns bordering the canal and those bordering the river. This is, in effect, a proof of the wide and beneficent influence of the canal, even upon the eastern counties. The fact that the phenomenon is not reflected in the remote towns, which we should suppose less sensitive to commercial stimulus, at once strengthens our proof and serves as an index, pointing to that influence.

In its magnitude this acceleration is not paralleled in any other section treated, for, while the same cause is operating with even more force in Subdivision III-A, yet the rate of growth of that section is already so great as not to admit of accentuation, even with the unusual transportation and other facilities offered. Its population, too, has been increasing rapidly for fully ten years, partly in anticipation of the canal, thus producing a phenomenon of premature effect, while the result upon the older and more conservative country is not distinguishable until after the influence has been operating for a definite length of time.

The interior townships, containing 75 per cent of the area and nearly 60 per cent of the population, exhibit no marked fluctuations—though presenting a very uniform and slow growth—and apparently were not much affected by the canal over and above their share in the wide-spread benefits accruing to the state (plate No. IV, upper diagram). Their population, one would suspect from the curves shown, was agricultural and their lands not peculiarly fertile. They were more populous in 1810 than either belt of Division III, but as early as 1820 Division III had attained a like density. The wonder, perhaps, is that this unattractive rear belt, with the depopulating tendency of the westward movement, was not actually diminished, rather than slowly yet steadily increased. Throughout the period discussed, we may state, there existed a much greater difference between the A and B belts in the eastern than in the western division—the A belt being more populous east than west and the B belt more thickly peopled after 1820 west than east.

We may add also, to avoid being misconstrued, that the classification adopted in this chapter could not be expected to distinguish the full local variations of the distribution in these counties, as affected by the canal. Such phenomena, for example, as the changes brought about by the transfer of terminal and other business from Schenectady to West Troy (Watervliet) and Albany, and from Lewiston and Black Rock to Lockport and Buffalo, do not appear, since a single subdivision may include the shifting population both before and after its migration. (See, in this connection, the latter part of foot-note No. 12.)

Division III represents a territory very little developed until canal days, its initial density of population for the period 1810

to 1840 being not greatly in excess of one-half that of Division II, last discussed, but while Division II increased invariably less in density of population than the state as a whole, Division III, up to 1845, far surpassed the state in its periodic progress. From 1820 to 1845 the population per square mile increased about uniformly, and on an average by 1 $\frac{1}{4}$ persons yearly. Although it increased by a less percentage than New York City (represented by Division I) for the entire period, yet for all but the concluding five years, or during the quarter century from 1810 to 1845, its population tripled; that is, there were 60 instead of 20 inhabitants to every square mile in 1845, as compared with 1810, while the population of the metropolis increased only in the ratio of 2.9 to 1. Eliminating the unavoidable discrepancy in this division in the 1810 figures, that slight difference might perhaps disappear, but the comparison still emphasizes the abundant and unexampled prosperity and growth of the district under consideration throughout the range of its 7,700 square miles. For 25 years of the 50 year period which we discussed, the western border counties, comprising from one-sixth to one-seventh of the area of the state, outstripped all the other sections in point of relative growth. There is a slight acceleration noticeable at the time of the final opening of the canal, but, as subsequent study reveals, this is confined to the rear towns and appears to be of little significance. The actual and final opening of the canal was not like the infusion of a sudden stimulant. Many such effects were experienced, but the long, wide-spread agitation, and the eight years of construction, during which "Clinton's big ditch" crept steadily through the western frontier, followed by the advance guard of commerce and industry, served to distribute its stimulating effect through the period before and after. In its largest signification it was a subtle, economic force, wherein both cause and effect were interwoven.

The canal was not indispensable to the advance of civilization. Without the opportune moment no canal or work of improvement could have produced the immigration, industry and prosperity actually induced. Yet without the canal the westward movement would have been much hampered, perhaps delayed, and unquestionably it would have left New York in its onward passage less

rich and fruitful than the Empire State of 1840 and 1850, to which history, as written on the printed page, and in every busy town and productive plain from Suffolk to Chautauqua, today bears witness. Natural resources are essential to the successful application of artificial, auxiliary expedients, but had man trusted to unaided Nature, his period of savagery would not yet be over.

It is of interest to note that from the date of the passage of the canal construction law up to the census of 1835 the gain of Division III is practically uniform; and that, while previous to this early date it partakes largely of the typical downward trend, it is again slightly retarded during the last five years, namely, from 1835 to 1840. For the first time since the beginning of the period its population increased relatively less than that of the entire state, and as Division II exhibits a simultaneous acceleration, the anomaly is the more conspicuous. It is difficult to say positively to what this feature should be ascribed, especially in the absence of connecting data prepared on the same basis; and it is perhaps idle for us to speculate or to lay stress upon a feature not very pronounced, where a continuation of the curves might tend to vitiate our conclusion. The retardation, however, from 1830 to 1840 is undeniable, as it is furthermore reflected in both Belts A and B. We shall recite several facts, therefore, which seem to us to have an obvious bearing on the case.

First, we may attribute the phenomenon, in a measure, to the continuous march of civilization westward. The region built up in middle New York State at the expense of the seaboard was now in turn contributing its quota to the states which had sprung from the great Northwest Territory. In the early days of the collector's office in Buffalo clearances from out of the state for the Erie canal were insignificant when compared with the great number of internal trade interests subserved (see table No. 4, already cited). By 1836, 54,000 tons of out-of-state shipments were reported as arriving at tide-water by way of the Erie canal, but in 1841 this amount had more than quadrupled and from about one-seventh it had reached the significant fraction of two-thirds the volume of local New York State traffic

arriving at the same point by the same channel, and this volume of internal traffic had itself dropped slightly in the interval. The ratio of foreign to domestic commerce continued to mount, although in no subsequent period of equal duration did it experience a like percentage of increase. The significant fact is, however, that where the West sent back to us its tens of thousands of produce, it drew from us its thousands of wealth and population, of which these were the fruit.

Still other facts suggest an explanation of the diminishing increment of gain through the western district. It may have been the outgrowth, for instance, of the business depression occurring about 1837, which would naturally reduce the amount of capital disposed to venture into a new district. Such a district would be indeed more sensitive than the conservative and opulent East to a panic and its consequences. Again, it will be observed by reference to the diagram that these counties of Division III from their commonplace position at the start (their density being practically the average for the state in 1810 to 1814) attain a density of population equal to the density of Division II at about the time of the completion of the canal; that they continue uninterruptedly in their upward course until 1.13 times more dense in 1835 than Division II, and that in 1840, in spite of the retardation and upward tendency in Division II, they are still 1.1 times as thickly populated as the older and more easterly counties. It might thus be readily conjectured that this section had, at the close of the period under consideration, reached a state of normal development, as compared with the seaboard district, and was settling into the beaten path of progress, and suffering, as is usual, somewhat of a reaction from the extreme rapidity of its advance; that, in short, there was now less potent reason for the extravagant disproportion between the prosperity of the western and eastern portions of the state, although the larger extent of undeveloped and productive country lying back from the canal and tributary to the western border counties, and their greater proportion of commercial population and interests, might still be expected to afford the western section somewhat more opportunity for further development than the eastern.

However that may be, the average rate of increase for Division III from 1840 to 1900 falsifies the argument that this divi-

sion had reached a very materially inflated state of development and was, from any cause whatever, about to revert and settle into a growth parallel to that of the older and less progressive regions. Its average increase from 1840 to 1900 is not only greater than from 1835 to 1840, but is scarcely less than its rapid rate previous to that date and greater than the rate of increase of the less dense region, Division II, during the same sixty-year period. Since we must thus acknowledge both a slight decline and a subsequent rise, and have been able readily to assign reasons for the former, it behooves us only to explain the second of these reciprocal phenomena, and the solution, as it appears, is not far to seek. This solution consists first, in the temporary action and timely cessation of the causes to which we have ascribed the previous decline—the panic, the excessive draught of the West and the over-exploitation of its resources. Secondly, it is not reasonable to question but that a powerful influence, restraining this tendency of decline and inoculating with new vigor, was the second great stride in the development of transportation systems, namely, the introduction of railroads, in conjunction with the enlargement of the waterways, which the railroads were at first designed to supplement and reinforce.

To recapitulate then, the data obtained indicate that Division III, taking a new start about the time of the actual authorization of the canal, increased with unequaled rapidity and marked uniformity, until by the year 1835, having become even more populous than the long-settled and well-established easterly section, having met the competition of regions further west and being exposed to the prevailing business depression of 1837, it faltered slightly, but soon resumed its previous rate of progress through its wonderful vitality—the outcome of its rich tributary area and those facilities for transportation, without which it must have continued a sparsely-settled farming country, namely, the canal and later the railroads, which the canal attracted thither and held to the best service of the community.

The separation from Division III of the border townships, comprising about one-third of the total area, offers opportunity for various significant comparisons. It is to be observed that many towns bordering on the lakes and others on the lateral canals have not been included in this class, and yet the effects

felt throughout this section are so striking that minor omissions do not impair the suggestiveness of the data.

From tables and curves illustrating them it will be seen that the figures for townships, both in Divisions II and III, since the detailed 1810 census was not available, fail to exhibit the acceleration in the rate of increase imparted about 1815. The data for Subdivision III-A do, however, in their main features correspond closely with those of Division III, indicating in general a very rapid and uniform rate of increase from about 1815 to the noticeable decline in the rate towards the end of the period. In certain respects, now to be investigated, however, the data for the division and the A belt differ. At the beginning of the period 1814 to 1840 the density of population of the A belt was about eight-tenths that of the B belt. By the date of the passage of the canal law the former had presumably almost risen to the same magnitude as the latter. At the end of the period, in 1840, the A belt had become about $1\frac{3}{4}$ times as densely populated as the B belt, its final density being more than five times its initial density, so that its rate of increase was nearly twice that of the corresponding B belt.

It thus appears that the inherent relations existing between the two zones of Division III were very different from those discovered in our treatment of Division II. In the latter case the relative standing of the two classes was well established before canal days and changed but little throughout. On the contrary, in the case of Division III, those regions back from the canal had actually been more thickly settled at the start, but evidently, in part at least through the influence of the canal, the population became concentrated more and more along its banks (see plate No. III).

We pass next to the consideration of Division IV. This is the last class of counties treated and comprises all those south and west of the border counties (Divisions II and III) and to quite an extent corresponds, as we have said, with the section known today as the southern tier of counties. In area it covers more than one-fourth of the state, is somewhat larger than Division II and approaches twice the size of Division III. In situation it lies off the natural and earliest improved routes of communication, the larger lakes, the rivers and the through canals.

From the smallest density of population encountered in the whole range of the classification adopted, namely, about six-tenths of that for the state at large and for Division III, these counties attained a density nearly $3\frac{1}{2}$ times as great at the close of the period. Thus, while their final density scarcely exceeded $\frac{3}{4}$ that of the average for the state and was in a less ratio with respect to the other divisions treated, yet they had experienced a percentage-increase throughout the entire period slightly greater than that of the marvelously advancing canal counties of the western section. They had maintained and increased their slight superiority of rank above that of Division III on the basis of population relative to the whole state, so that they comprised 21.9 per cent in 1840, while Division III comprised 20.6 at the same date, the two having risen from 15.9 and 15.7 respectively. This fact does not detract from the anomaly of the growth of Division III, however. The density of Division III continues about twice that of Division IV. Considering relative densities, a far greater percentage-increase would thus be normal for Division IV than for Division III, and Table No. 19 and plate No. V will properly illustrate the comparative growth on a fair basis. Yet from this same table, which exhibits the superiority of Division III, it will be seen that Division IV makes a much better showing than Division II, its percentage of gain from 1820 to 1840 being twice that of the latter.

It is, of course, impossible to state to what extent the canal was responsible for the upbuilding of the non-contiguous counties. A glance at the curves depicting these data will, however, prove instructive. The curve of increase of density parallels that of the state for some years. It stands, however, alone among all the divisions, in that no retarding effect has apparently been felt between 1810 and 1814, a constant rate of increase being observable from the start to 1830. This may be due to the minimum susceptibility of the inland counties to the drain and perturbations of warfare. On the other hand, the absence of an acceleration, corresponding with that of the remaining divisions, may in part be regarded as a witness to the lesser effect of internal improvements on these remote counties, and to that extent it is a confession of the extraordinary beneficence of the

canal and other allied influences upon those divisions which do exhibit so marked an acceleration.

The effect on the counties bordering the lateral canals has been treated separately, moreover (in table No. 20), and their density may be seen to have increased very uniformly, and from a much smaller initial density than the whole division, by a much greater rate of increase. Their more westerly location in general is, no doubt, responsible for this phenomenon, as the lateral canals themselves were not constructed until about the end of the period.

We have already called attention to the fact that the rate of increase of Division IV was somewhat diminished in 1830. Again, the diagram will illustrate the fact that it dropped by about an equal amount in 1835 and similarly in 1840, until during the period 1840 to 1845 it had attained about the average rate of the period 1840 to 1900, or in other words, settled conditions at length prevailed.

Thus, both Divisions III and IV resemble one another in the retardation at the close of the period. They are widely diverse in one particular, however—the prompt recovery in the one case and not in the other—which is worthy of distinct and careful consideration.

It requires no proof to assert that the canal, with its inducements to navigation and thus to the manufacturing interests, attracted such interests to its immediate shores and fostered them, on account of their ability to undergo congestion, more largely than the agricultural vocations. It is true, as we shall soon demonstrate, that agriculture experienced a liberal growth where subjected to canal influence, while the railroad seemed to discriminate in favor of the manufacturer and his high-priced products and against the farmer and the bulky produce of the soil. But it is also true that the canal had its largest share of direct influence in the State of New York in building up the infant industries of commerce and manufacturing. Let us ask what would have been the condition of New York State today if it had been obliged to depend upon agriculture as the principal pursuit of its inhabitants and chief source of its wealth, eliminating from immediate consideration, so far as possible, competition, which has entered our home market from the West.

We need only examine the statistics of population as roughly proportional to the progress of a people to answer the query propounded.

The year 1840 is the extent of the period which has been treated in detail. The research has been carried to 1845 in the single instance of Division IV to study the effect of lateral canals. However, data for the year 1900 have been compiled and, as already explained, the average rate of increase for the 60 years has been ascertained and the curves of density continued five years beyond 1840 to illustrate this rate for comparison with previous rates.

Proceeding with this comparison, we observe the wide difference which exists in the rate of increase after 1840 for the several other divisions and that for Division IV up to a moderate density. Until perhaps 1830 or 1835 and an attainment of a density of 30 or 35 per square mile, the growth of this inland section was not so materially different from that of districts given over to commerce and manufacturing, and which were developing under normal conditions. However, having attained its critical density, there remains for it nothing but a slow and painful struggle with gathering forces of contention. Its improved lands could not stand the natural increase of population, not to say invite an influx, and as a result there was a continual thinning of the youth, which was scattered among scenes more promising, or was attracted to urban life. This is true of agricultural regions generally and more especially so in a partially developed, resourceful country, such as our own. Among the older nations the scarcity of facilities for expansion sooner stimulates the inventive genius to utilize to better advantage the limited area available. Even there it may be set down as an economic principle that the commercial and manufacturing industries, admitting of greater concentration, will develop what may be termed a crucial density of population at a much greater absolute figure than the agricultural community. In the latter each new inhabitant who separates unto himself a few acres of land renders the per capita return—other things being equal—just so much smaller. The income per acre may thus be said—expressing relations in mathematical terms—to vary inversely as the density, while, as the single example of New York (Divi-

sion I) demonstrates, the increasing population of the manufacturing or commercial city tends to provoke still further gain through the better facilities afforded such industry by concentration of capital and division of labor. Again, such a community increases, so to speak, according to some power of the density, or in a geometrical progression. The agricultural district, in short, and the manufacturing or commercial district increase on a somewhat similar basis until the attainment of a certain density, varying in amount with conditions, beyond which point of saturation, shall we say, the agricultural section suffers a retardation and its growth is very slow or merely nominal—it can stand no more—while the sister community of different organization proceeds to the very acme of its existence.

Had the great manufacturing belt along the course of the Erie canal grown up, nourished only by its native fertility of soil, even though the same facile transportation and the same ready market were provided—had this world-famous industrial section, the glory of the “up state”, been consecrated and devoted to plow and scythe in preference to loom and foundry, then, we answer, New York might well have gained like the inland tier during the 60 years anterior to 1900 scarcely more than a single person per square mile on the average, instead of eight persons per square mile, as she actually did during that period. Then had Syracuse and Rochester and Buffalo, yes, and Albany and Utica stood today, thrifty market-villages. If the canal had prospered only the farm lands and failed to lend the first and shaping impulse to the upbuilding of the centers of industry, if on the site of the Salt City and the Flour City it had instead nourished farms, however productive, and orchards, though never so flourishing, could our New York have become the Empire State, to hold for so long a supremacy among the sister states, to breathe the spirit of industry and commerce in a measure tantamount to the wildest dreams of her far-sighted pioneers?

In order to present, in compact and terse form, some of the most distinctive observations to which our study of local population in the period under consideration has led us, plate No. III has been prepared. To reduce the data already obtained to the desired terms, the lengths of the several divisions and subdivisions

were first ascertained to be roughly as follows: Subdivision II-A, 270 miles; Subdiivision II-B, 310 miles; Subdivisions III-A and III-B, 232 miles; and Division IV, 225 miles. From these figures and areas given in the tables the average widths of the several belts were approximately computed. Of the A and B belts one-half of each was assumed to lie south of the canal. If the average densities of population for any year, already determined for the several sections, were assumed to prevail at the middle of these strips to the southward of the canal, and in addition if Division IV were regarded as a third strip with a known density midway of its width, then a good idea could be had of the variation of the population in crossing the state from the Pennsylvania line to the canal. This treatment, pursued for both eastern and western divisions and for one census before and one after the construction of the canal, results in the diagram of plate No. III. That diagram shows the extent to which the direct local influence of the waterway extended, at least on our basis. Exactly how many miles from its shores this might be, is a matter of judgment in the interpretation of the curves. Apparently it is noticeable for ten miles or so in the East and possibly fifteen in the West. The diagram also exhibits the transformation which overtook the immediate margin of the canal in the West, especially as compared with the settled conditions in the East prevailing both before and after the construction days. The diagram only summarizes and verifies data heretofore discussed and presents them so forcibly as to furnish a fitting conclusion to our study of the effect of the artificial waterway on the population of the state.

We proceed now to a discussion of the other statistics compiled, in which we omit Division IV for the sake of brevity, considering only the first three divisions.

*Unnaturalized Male Aliens.*⁴⁶

Period Treated—1820 to 1835.

The data of the alien population are of extraordinary interest because the State of New York more than trebled its percentage of aliens between 1820 and 1835. The change of condition is

⁴⁶It should be borne in mind that the term, *percentage of aliens*, means the number of male aliens per 100 of the total population of men, women and children, all told. Tables dealing with this subject are Nos. 22 and 26 for data and 33-37 derived from them.

thus more marked in this than in any other respect of which we treat and the question of distribution of the new class of population assumes commanding proportions.

In nearly all respects, as is to be expected, Division I, New York City, leads the several sections in growth, that is, in absolute increase of per capita figures, so far as the present statistical résumé indicates. Exceptions occur, but principally in the case of agricultural statistics. When, however, gains are considered in percentages of the original figures, the order of standing is materially different and is often reversed. We have already remarked and cannot too strongly insist that neither system of treatment is wholly fair as a basis of comparison. Absolute increase of per capita figures may be very slight, comparatively, in the small district which has really doubled or quadrupled its interests. On the other hand, if mere percentage figures, based on original data, are adopted, the installation of a single relatively large industry in a region hitherto undeveloped in that branch may seem to indicate that this whole region has developed in a phenomenal manner, and would be unfair to the district given extensively to a like industry, yet whose periodic gain can be but a small percentage of its vast interests. This feature would be apparent in a comparison of New York, as Division I, with the several other divisions in relation to their alien statistics. In actual increase of aliens per 100 of the population Division I ranks first, being from $1\frac{1}{2}$ to 5 times greater than the other divisions and subdivisions; but, on the basis of percentage-increase over the initial figures, Division I is eclipsed by all the remaining divisions (though not by Subdivision II-A), the percentage-gain in numbers being from 6 to 7 times as great for Subdivision III-A as for Division I.

That from 4 per cent of its population, the aliens increased to more than 10 per cent in the 15 years from 1820 to 1835 indicates, however, that the city had, during this period, taken a long stride towards that cosmopolitan character which it now possesses. Even to the present time the percentage of alien population in the entire state has risen to little more than the figures for the percentage in New York City in 1840.⁴⁷ The metropolis was thus be-

⁴⁷The New York State census of 1905 reports 12.4 per cent alien population in New York City—statement in *New York Sun*, Jan. 16, 1906.

coming a center for the alien population not only of this state but of all America, and the reason for this is not far to seek.

We have presented evidence to show that the commercial prestige, both domestic and foreign, passed at the time of building the Erie canal from Philadelphia to New York, that the superior inland communications of the latter supplied return cargoes for the transatlantic trade and attracted thereby the European lines. With the foreign vessels transferred to New York came also the foreign immigrants as a matter of course, and for the further good and sufficient reason that the metropolis, as we have said already, was the "Gateway to the Interior"—that rich interior which with its surfeit of resources was the ultimate objective of a large proportion of the new comers. If these immigrants yearned for the crowded conditions of their home countries, they were best contented to remain in New York. If they sought communication with kinsmen or clients who had gone inland they established themselves in New York. If, going inland themselves, they still desired to maintain ready connection with foreign shores, New York City was the principal intermediary between them and the great terminals of Europe. In any case the metropolis became their rendezvous and profited accordingly. Thus, while in contrast Philadelphia is today the distinctively American city of the East, containing the largest percentage of native-born inhabitants, New York, shorn of its foreign population, would sink, startling as the fact may seem, almost to a position of mediocrity. In proof whereof, compare the native population of the two great cities from the 1890 census and it will be found that on this basis the New York of this recent day is scarcely twelve per cent larger than Philadelphia.⁴⁸ So many nations have from the first participated in the upbuilding of our metropolis that it has always savored of racial incongruities, but the foundation of its real cosmopolitanism may be traced, thus, back to the acquisition of the foreign trade in the early years of the last century.

Referring to the curves of plate No. IV, it will be seen that in both Divisions II and III the percentage of unnaturalized alien population in 1820 was virtually insignificant, less than one per

⁴⁸See the *Abstract of the Eleventh Census*, p. 43.

cent in each case, and that in all the subdivisions this percentage diminished as the distance from the coast increased, presumably owing to the fact that the immigrants lingered, at least until naturalized, in the more thickly settled portions and likewise those nearest the point of disembarkation, while it was the natives, thoroughly schooled in the peculiarities of the land, the hardships of the soil and, perchance, the treachery of the aborigines, who ventured to a greater extent on to the frontier settlements. This distribution might perhaps be accounted for in part on the less plausible ground that, if there were foreign traders, they would easily escape enumeration as transients or from ignorance of their whereabouts. The extensive acquaintance of western New York developed by the military operations of 1812-14 doubtless also conduced to native occupation rather more than alien. However that may be, it is significant that only fifteen years later, in 1835, the ranks of Divisions II and III in this respect are seen to be reversed. The growth in numbers of aliens had kept pace with the increase of population in Division II, but it had also more than kept up in the western section with the wonderful increase of the canal counties. The glitter of prosperity and fascination of the opening of a new and rich country, with its unexploited opportunities, attracted them inland.

Still, as table No. 16 will indicate, the inhabitants of the state were in 1855, 64 per cent of them, born in New York, and 73 per cent were of American birth. The fact that the eastern part of New York supplied a large proportion of those who settled the western lands, first of our own and then of other states, is, by such figures, reiterated authoritatively. Of the other Americans contributing to our upbuilding, the sturdy New Englanders to the east of us, in conformity to the western movement of population, constituted the largest part. The local history of the middle of the state abundantly testifies that, "for thirty-five years after the Revolution," to use the language of a well-known writer, "the great immigration was from New England."⁴⁹ Our countrymen have been our advance guards in the progress of settlement over the middle and into the western states, while the

⁴⁹*Historic Towns, New York*, Theodore Roosevelt, p. 174. (1891.) See also *New England in New York*, by Hon. Stephen Holden, in *Transactions of the Oneida Historical Society*, No. 9, pp. 42-55. (1903.)

greater proportion of the European influx has followed after the example was once set and the way made easy. It was when our extraordinary prosperity became well known and the resources of the land were rumored far and wide, that the aliens began to flock to our shores; and the earliest years of the canal mark the point of turning as nearly as any brief period can mark so vast a movement in the evolution of history.

Not only did the canal induce activity of business and furnish opportunity for obtaining a fresh start in life and thus operate to attract the alien population, but, from the construction days on, it supplied immediate occupation for an army of laborers, in whose ranks the humble emigrant from foreign shores found employment suited to his capacity and rich in its returns as compared with that he had lately forsaken. Little by little the day was drawing near when he should become a chief reliance of the American public in its projection of great public works. To how small an extent this condition prevailed when the canal work began, however, may be inferred from the following sentence, taken from the *Canal Commissioners' Report* of January, 1819, the year in which the first section of the canal was opened:⁵⁰ "A very few of the contractors are foreigners who have recently arrived in this country; but far the greater part of them are native farmers, mechanics, merchants and professional men, residing in the vicinity of the line; and three-fourths of all the laborers were born among us." Obviously, when foreigners constituted so small a proportion of the laboring class of the lowest order, their percentage of the whole population must be almost insignificant, as indeed our study has already indicated.

Reverting to that study, we find that figures for Subdivision A reveal something of a paradox. The relations of that subdivision in 1835 for the eastern and western parts of the state are the reverse of those established for 1820, and for the divisions at large in 1835. Proceeding from the coast along this belt, the percentage of unnaturalized alien population somewhat diminishes throughout, as in 1820. This signifies that the alien growth has been, relative to the increase of the total population, much greater in the border towns of Division II than in the rear towns,

⁵⁰Page 10.

and in fact the percentage of alien population of the rear towns has fallen in the fifteen-year period from six-tenths to three-tenths that of the corresponding A belt. In the B belt of the western division during the same time the percentage of alien population has also dropped from once to five-tenths that of the A belt, thus indicating a similarity of relative development for eastern and western sections in this particular. Yet, when it is observed that the two western belts started on the same basis, each having, in 1820, three-tenths per cent of alien population, it will be seen that there is implied a much more favorable record for the B belt in the West, since it increased as rapidly with respect to the A belt as does the B belt with respect to the A belt in the East. Indeed, it is but necessary to put the comparison in another way in order to make that statement apparent, for we observe that the rear towns in the East in 1835 contained only one-third as many aliens per 100 of the population as did the border towns, while in the West the rear towns contained over one-half as large a percentage as the corresponding border towns. This signifies first, that the A belt seems to be more attractive to the alien population in the East, and the inland, or B belt to the immigrants in the West; and secondly, it implies that the anomaly of an increasing population of aliens in 1835, as one recedes from the coast towards the lakes, a feature which we have discussed at length, was largely accomplished through the attractiveness of the B belt of the West to alien immigration (plate No. IV).

The occasion for these conditions merits inquiry. We shall discover later that the B belt seems to be devoted to the three primary occupations of life (excluding navigation) in about the same proportions in 1840, east and west, but that the increase of the agricultural element—and to a much less extent the manufacturing element—is apparently greater in the B belt West, while the increase of the commercial interest in this belt is greater in the East. (This last-named feature may be due to the influence of Long and Staten Islands.) Moreover, the A belt is, throughout, the commercial belt, and the B belt is more exclusively devoted to agricultural pursuits. Whence it appears that the phenomena of rapid agricultural and rapid alien growth

are in the West coextensive, while commercial and alien growth would seem to go together in the East.

To take the next step in the explanation it is needful to recollect the two classes or types of immigrants. The first class presumably sought altogether the western country with its larger opportunities. These resembled our native pioneers. They were the more courageous and ambitious, those yearning for an independent livelihood and a home which they could call their own, and which, though but a mere clearing in the forest, would yet secure to them and their families the blessings of freedom and opportunity. They went largely to settle on farms as tillers of the soil, and having generally little capital and being unable to purchase the most expensive lands along the waterways and in the thickly-settled districts, a large relative proportion often located in the rear townships. But on the contrary those of the second type—refugees from the congested peasantry of Europe—feeling more at home in crowded quarters, and drifting rather with the tide of events, clustered along the coast and in the older seaward districts, and gave themselves up to commercial pursuits in which they must assume a position of subordination. This seems to be the rational explanation of the distribution and changes in distribution of the alien population, the immense growth throughout the state and the disproportionately large growth in the western part. Such an explanation is somewhat labored and occult, perhaps, being so complex in the derivation of its premises, but it seems plausible from a deductive as well as an inductive basis of inquiry. And whether through the invigoration of commercial interests directly, or indirectly through the opening up of new regions to agriculture and to immigration, the guiding and shaping impulse of the canal is clearly discernible.

From the statistical tables we turn for a brief consideration of the nationalities represented in the increase of alien population, and find that the Irish and Germans were by far the most numerous immigrants to the United States, and of these about 60 per cent more Germans entered in a period of $36\frac{1}{4}$ years than Irish; yet the resident population of New York State contained in 1855 over twice as many Irish born as German born, showing probably that the latter preferred to go west as pioneers, or at

least out of the state. Even the English emigrants, though numbering hardly one-sixth as many as the Germans during this period, were one-half as numerous in the resident population.⁵¹ Of course this was later than the period we discussed and other circumstances had influenced the conditions, yet it would seem to indicate that the Germans were of the first type of immigrants, the more intelligent and the more sturdy.

We have now briefly to review the study of alien population, in concluding our treatment of that subject. Division III, as has been stated, contained a very trifling alien population in 1820 (about 3 unnaturalized male aliens per 1,000 inhabitants); but its alien population not only increased more rapidly than that of Division II, it further increased much faster than its own increase of total population, until, in 1835, its percentage of aliens exceeded that of Division II by a small margin, having multiplied tenfold. Reasons for this fact are to be found in the circumstances already recited. While such was the effect of the fifteen years of canal-building and operation on the counties of the western part of the state, in the subdivision comprising the border towns, lying without those counties, the same feature is seen to be accentuated. These western townships of the A belt possessed in 1820, in comparison with Belt B, even a smaller relative alien population, namely, an average of 3 per 1,000 inhabitants, or less than 300 aliens all told. They experienced a twelvefold increase of per capita figures, rendering the proportion of their alien population twice that of Belt B, instead of equal to it, as in 1820. Notwithstanding all this remarkable growth, as will appear from a survey of the compilations, the western border towns, however, failed to surpass the border towns of Division II in percentage of alien population at the close of the period. This review thus substantiates and emphasizes the conclusion that the canal is responsible to a considerable extent for a transfer of the zone of densest population and most intense activity from the parts of these western counties remote from the canal to its present location on the border strip.

It would also seem probable that the greater per capita growth of the alien population in the newer regions of the West was the outcome of the fact that aliens resorting thither settled on the

⁵¹Data from paper by Franklin B. Hough read before the "American Geographic and Statistical Society," as reported in the *New York Tribune* of July 3, 1867.

farms and engaged in agriculture to a somewhat greater extent than those remaining in the East, who apparently found congenial occupation in the trade, commerce or manufactures of the urban districts. Again, the significant fact must not be lost to sight that from twice to three times as many aliens per 100 inhabitants dwelt in the A as in the B zone and that the absolute increase in this A belt was remarkable and unprecedented.

Subsequent history enables us to see that the change in the percentage of alien population during the period treated presages a great social revolution. The chain of evolution has been forged whereby the latest arrivals serve the nation as laborers, then rise to gentility, and their place is filled in turn by more recent comers. The wheel has been set endlessly turning and an upward impetus, a centrifugal force, given to society; but oftentimes so rapid has been this impetus that it has threatened to overwhelm our republic. Realizing that the alien never represents normal, natural increase, but always a growth due to commerce, virgin resources, and alluring opportunities, we may easily draw the inference, well accredited by the magnitude of the hypothetical facts—the gains and the ratios—that it is one evidence at least of the stimulus created by the canal and one manifestation of its sweeping influence.

Improved Land.

Period Treated—1821 to 1835.

Turning from the subject of foreign population, we enter upon a consideration of agricultural statistics, and first, of the amount of improved land.⁵² Division I is hardly worthy of consideration in this respect for obvious reasons, and we omit it altogether.

In Division II an improvement in the direction of agriculture is noteworthy, the percentage of the total area improved increasing from 34 to 47, that is, a little more rapidly than the population. It just about holds its own with respect to the entire state. In Subdivision II-A, the border towns, on the other hand, although they experience the same percentage-gain, about 37 per cent, and although the amount of improved lands is increased from nearly $\frac{1}{2}$ to $\frac{3}{4}$ of the total area, yet the rapidity of increase only keeps pace with the increase of population. In fact the average amount of improved land per capita was one-

⁵²See tables Nos. 22 and 26 for data, and 33-38, inclusive, for deductions.

tenth of an acre less in 1835 than in 1821. Here the relative increase of per capita figures is considerably more favorable to the B than the A belt of Division II. In so far as the difference does signify, it probably means simply this. With an average density of population from 70 per square mile in 1820 to 110 in 1840 on the river and canal front and available farm lands back in the next row of townships, the smaller cost of productive land therein was commencing to be a sufficient factor to compensate for the extra haulage of products to the navigable waterway, and the farmers were flocking in greater numbers, proportionately, to this more remote district and taking up and cultivating the rude lands. That the remote district at the start and throughout the period exhibits a larger per capita acreage of improved lands, indicates, however, that it was to a greater extent an agricultural district even before trade due to the canal enhanced the commercial activity of the border towns. This statement applies alike to Divisions II and III.

In Division III the percentage of land improved is more than doubled in the fourteen-year period, so that the increase surpasses the increase of population and hence the per capita figures gain by 30 per cent, there being 4.4 acres per capita under cultivation in 1835, as against 5.6 acres in Division II. With Subdivision III-A, however, the percentage of 18 (or one per cent less than Subdivision III-B) at the beginning, multiplies $2\frac{1}{2}$ times, passing and materially exceeding at the close of the period the figure for the B belt, in spite of its per capita increase of 100 per cent. This is an increase greater than the increase of population, but not nearly so great relatively as that for the B belt, which doubles its percentage of area improved, so that the absolute per capita figures are not so great for the A belt in 1835 as for the B belt in 1821. Thus it appears that in 1821, and to a less extent in 1835, the present border towns of Division III were not nearly so well developed agriculturally as the remainder of the border counties.

It is reasonable to suppose from this, especially in the light of the data previously discussed, that better lands by circumstance of fertility or accessibility originally lay back from the canal location and that these would naturally have become the seat of the greater prosperity; but the canal influence, entering forcibly at about the beginning of the period, imparted such

artificial advantages to the zones next bounding it as to build them up to a relatively greater extent than the other section.

At the conclusion of this period the western section had not become so well developed agriculturally as Division II, although its population was by that time considerably more dense. From an examination of detail it will nevertheless appear from the percentages of improved land for the several sections that the back part of the counties did, as a matter of fact, attain an agricultural activity slightly greater than that of the corresponding zone of Division II, doubtless through its better relative start with respect to the adjoining A belt and its natural advantages, combined with the benefit due to unusual growth of population. It is not to be forgotten, however, that there was a decidedly greater increase in agricultural interests compared with population in the western than in the eastern section. This feature, common to both subdivisions, while somewhat characteristic of a new country, may be taken, when it is remembered that the growth in the West more directly reflects the influence of the canal, to illustrate the not inconsiderable immediate impulse given by the canal to the upbuilding of agricultural interests.

Although the figures for the whole state show less rapid increase in agriculture than in other lines, the setback to its agricultural interests through competition with the produce of the far West came into prominence more particularly after the concluding date of this period. It was, in a measure, a direct consequence of the canal as a cheap through route for transportation from the interior of the country tributary to the Great Lakes, and thus a powerful testimonial to the effectiveness and indispensability of the trunk of the system. It would seem hardly reasonable on this ground to prefer against the canal, however, a charge of wrecking, or even injuring the agricultural interests of the state. The canal very likely hastened the competitive struggle somewhat, and lured it first into our midst, but we cannot presume that the same contest would have been withheld long in the absence of the canal, knowing as we do the subsequent history and efficiency of railroads. That so much of the competitive produce of the West was first and permanently turned into the channels leading across our state to contribute

so largely to our commercial primacy rather than to be deflected elsewhere, had the opportunity been lost to this state, is, it would appear, one of the principal benefits which the Erie canal secured to us in its early days.

Number of Persons Engaged in Agriculture.

Period Treated—1820 to 1840.

From the treatment of a certain phase of the general subject of agriculture we proceed to another point of view. Having considered the areas of land devoted to this pursuit, we come now to a discussion of its rank and attractiveness as an employment.⁵³ We deal no longer in acres of land but in numbers of men and percentages of the total population. We treat also of a period of time lengthened five years beyond the close of that heretofore considered, statistics for the same period not being available. By reason of the relative unimportance of Division I in this particular, it will be again ignored.

In Division II we find that the number engaged in agriculture is somewhat less than doubled, but the percentage of the total population thus engaged is increased by about one-fourth its initial amount. In the subdivisions this percentage-increase of per capita figures is very nearly duplicated, though a much larger proportion of the inhabitants are thus employed in the B than in the A belt, both at the beginning and end of the period, verifying the conclusion that the district more remote from the waterway was from the start to a greater extent an agricultural district, the relative conditions of division and subdivision not being materially altered by the canal.

Again, in Division III the percentage of the total population thus engaged increased but slightly from the beginning to the end of the period. The actual percentage-increase of numbers is a little less than the percentage-increase of acres of improved land in the shorter period from 1821 to 1835. The fact thus becomes apparent, or is confirmed, that the startling increase of Division III was in its commercial and manufacturing population.

The percentage of the agricultural population was naturally lowered in the community by such an influx of persons engaged

⁵³For data on this subject see tables Nos. 23 and 26, and for deductions Nos. 33-37, inclusive.

in manufacturing and commerce, which obviously, however, is not inconsistent with the known fact that the agricultural interests were liberally stimulated and the absolute number of persons thus employed greatly augmented. Even the percentage-increase experienced by Division III in numbers engaged in agriculture per 100 of the population is confined to the portion back from the canal, since Subdivision III-A indicates a slight loss in this respect. As we have now ascertained that in the rear townships a greater percentage of the population was engaged in the agricultural industry and a greater percentage of the area was devoted to this pursuit than in the border towns, we are, therefore, again led to the conclusion that agricultural development had proceeded to a state of considerable advancement in these rear townships before the beginning of canal activities. But, though by 1840 the advantages of the A belt afforded by proximity to the canal have induced a larger real agricultural growth than that which took place in the B belt, evinced by the far greater percentage-increase of absolute numbers engaged in agriculture, as well as by the larger percentage of improved land, yet so remarkable has been the increase in population, especially in urban population, that the percentage of the number of inhabitants engaged in agriculture is not even able to hold its own in Belt A, whereas in Belt B it rises several points during the twenty-year period.

Average Amount of Land Possessed by the Individual Engaged in Agriculture.

Another study of passing interest suggests itself in connection with the agricultural data. By assuming that the acreage of improved land increased throughout the period 1820 to 1840 at the same rate as during the known period 1821 to 1835, we may obtain, by extrapolation, figures corresponding with the former dates, and by comparing the areas thus obtained with the number of persons employed in agriculture from 1820 to 1840, a crude idea of the size of farms in the respective districts may be obtained.⁵⁴

⁵⁴See table No. 39. The 12th census gives the average size of farm in New York State in 1900 as 99.9 acres. It would seem probable, therefore, that the average size in 1820-1840, if accurately determined, would be larger than as above, i. e., several persons were employed per farm.

This study reveals the fact that during the double decade under consideration the amount of improved land per capita in both belts of Division II decreased, while in the two belts of Division III the same period of time saw an increase. In Division II the greatest change was in the border towns. In Division III the reverse condition obtained, decidedly the largest fluctuation which occurred anywhere being from 10 acres to 25 acres per capita in Subdivision III-B. It is further notable that the concluding figures are about alike for the two sections of the B belt (though slightly larger in the East), but are larger in the East than in the West for the A belt. Again in 1840, the number of acres per individual engaged in agriculture was throughout greater in the B belt than in the A belt (although practically the same throughout Division II), a condition exactly the reverse of the relations existing in 1820.

The study simply suggests, not as a matter of proof but of rational conjecture, that in the new region, the western division, there was a tendency to larger per capita holdings. This may signify larger farms as well as more of them, but it probably means the employment of less help, due to the introduction of labor-saving devices, or to an educated intelligence and a more extensive application of the scientific principle to agricultural operations. The condition in the East, however, is more likely due to the overcrowding in a well-settled district, or to a more refined state of cultivation and a consequent reduction in size of farm, or holding, necessary to supply the individual and the limited or fixed patronage.

This feature in Division II thus very poignantly supplements the discussion of increase of population of the agricultural as compared with the manufacturing or commercial district and tends to confirm the important principle there adduced, namely, that the agricultural district reaches at a moderate density a limit to rapid development, while the increase in population of the manufacturing district is practically unlimited. The average area of land which the farmers possessed, off of which to make a living, is seen in the older district to have been steadily reduced, while the average density of the newer region during the period had evidently not reached the limiting point.

It would further appear probable that the western portion had not reached quite the development of the eastern, agriculturally—at any rate in the A belt—by the year 1840, and this despite its greater density of population. Or, the smaller per capita area of land in the West may be due to the circumstance of the well-known fertility of the middle section of the state, generally superior to that of the Hudson valley, so that a farmer might subsist on a smaller acreage west than east. Or again, the significant inference may be warranted to the effect that this smaller per capita area and the considerable increase in size of farm between 1820 and 1840 in the West is attributable to the change brought about in the character of crops raised. It is well understood that when our forefathers found competition from farther west overwhelming them in the production of grain as a staple article, many turned to fruit-raising and found that a more remunerative employment, until parts of our western lands have become famous for orchards and orchard products.

Most significant of all, perhaps, and most completely explanatory of the conditions, is the supposition that where the advance guard of canal-builders found the scattered settlers tilling ground and growing food to supply a territory of a few miles' radius—perhaps each man only his own and his neighbor's table—the great waterway promptly opened up to them a much enlarged market for their goods and, by making transportation so cheap that it did not consume all the profits on produce shipped, enabled and encouraged the farmers to extend their lands and increase their crops far beyond the requirement of their local needs. Thus the number of acres per person engaged in agriculture increased in the western section, where the facilities had previously been poorest and where the improvement in means of communication was most pronounced.

Again, that the acres per capita engaged in agriculture were more in the rear towns than in the border towns, might be supposed to signify that near the canal a man could more readily obtain a living, or in other words, that the minimum size of a farm which would support an individual and family was less in Belt A than in Belt B. This condition of things being conspicuous only in the West, where the canal was most effective

and independent of other coordinate influences, and where, in this respect too, the relations of belts A and B had been exactly reversed since 1820, is a condition which would tend to show the utility of the canal and its effect as an economic force.

A feature worthy of consideration in this connection and throughout the discussion, is the fact that the slaves were included in the schedule of persons engaged in the three gainful occupations enumerated in the 1820 census. These slaves were presumably employed for the most part as agricultural laborers. Now, as a result particularly of the relative growth of commercialism, the influx of foreigners and the increase of the small land-owning class, and also of the diffusion of knowledge and morality, the majority of the slave population was emancipated in 1827 in accordance with a statute of the year 1817. The number of slaves in New York had been decreasing rapidly for years, but as late as the 1820 census New York contained about ten thousand negroes in bondage and outranked in this respect all the remaining states of the East, north of Mason and Dixon's line. By the year of the next Federal census, that of 1830, but seventy-five slaves remained. From this statement it might be surmised that the first impulse of many of the ten thousand negroes, on gaining their freedom, would be to shift quarters, and that a corresponding diminution of the numbers engaged in agriculture and an increase of the per capita acreage, would result, thus confusing the statistics and discrediting the deductions. However, as the acreage per capita engaged in agriculture in the East, where the slave-holding population must have been strongest, decreased both absolutely and relatively to the West, this factor would appear not to be of great weight. It is true, moreover, that the number of freedmen, that is, colored citizens, in the 1830 census appears to be about ten thousand in excess of the 1820 figures, plus the natural decennial increase. Thus the probability seems to be that the emancipated negroes remained as paid agricultural laborers (much as did the majority of the southern negroes) after being released, and that the redistribution, though of so considerable a body, had little influence on the conditions discussed.

Number of Persons Engaged in Manufacturing (including the Hand Trades).

- Period Treated—1820 to 1840.

Next to agriculture, the most important occupation in the state and nation of 1820–1840, as we review that period, appears to have been manufacturing. In respect to the numbers for whom this industry furnished a livelihood, Division I again takes the pronounced lead, both in absolute percentages employed and in increase from date to date.⁵⁵ It is reasonable to impute to the direct influence of the canal not a little of this improvement, and the best justification therefor is the fact that barges which cleared western grain and raw materials for New York had to obtain a return cargo, preferably in that city, a cargo which would consist naturally of merchandise and manufactured products. The beneficent effects of the canal in this respect we have discussed in our comparative study of New York and Philadelphia as old time rivals both in their commercial and manufacturing interests. And we have seen that manufacturing supremacy followed no less surely than commercial supremacy, only lagging behind it in point of time, as a less direct, or after effect.

In both Divisions II and III the increase seems to have been noteworthy, being in the West practically twice as much as the increase in population; yet in spite of its far greater increase, at the close as at the beginning of the period, the West had a smaller percentage of its inhabitants engaged in manufacturing than the East. The inland had also a less percentage than the border towns. The B belt in both divisions increased less rapidly in this respect than the A belt, as would be expected from the superior transportation facilities of the latter. Such facilities, next to available power, always constitute the principal attraction to manufacturing interests. The study of the number of persons engaged in manufacturing, therefore, primarily emphasizes the remarkable increase, greater in the West than in the East, but even in the latter amounting to over 100 per cent, and leaving the West holding a better relative rank in the state as a manufacturing district in 1840 than in 1820.

⁵⁵For data relating to this subject, see tables Nos. 23 and 26, and for deductions, Nos. 33–37 inclusive.

Number of Manufacturing Establishments.

Period Treated—1821 to 1835.

Total figures giving the number of manufactories in a district are deceptive, since the relative magnitude of the interests is not thereby indicated. A locality may have seen its factories all renewed and developed in manifold ways and still the total number scarcely altered. Statistics of the invested capital, or assets or real holdings, or valuation of output are necessary to an enlightened discussion of the subject. Such, however, are not obtainable for the period desired (except in the incomplete and unsatisfactory enumeration of the Federal census) and we are therefore limited to the information which other available data convey.

For the year 1821 ten different classes of manufactories were reported in the census. For 1835 returns are given for these and also for several others. For the three main divisions of the state a compilation has been recorded in table No. 24 in full. The treatment of this item by subdivisions, however, was not deemed sufficiently instructive for publication.

A glance at the grand totals for the several divisions (table No. 40) will demonstrate the statement made above in regard to the unreliability of these totals as indices of growth or prosperity. It appears that the number of establishments of the ten kinds diminished from 1821 to 1835 throughout the entire eastern section, Division I included, while but a slight progressive movement can be detected in the western region. This does not mean merely that the per capita figures or percentages decreased, but that the actual number of manufactories of the ten different kinds was in many cases less in 1835 than fourteen years previously. Aside from the explanation already suggested, this condition is accounted for by the fact that many minor works, such as oil mills and asheries, prolific in 1821, were by 1835 outgrown, so to speak, by the community and becoming obsolete, while works too insignificant for enumeration in 1821 had in fourteen years attained some considerable prominence.

The appearance of a smaller total number of manufacturing establishments in 1835 than in 1821 is so misleading that further treatment has been given, and the totals compared with numbers of persons engaged in manufacturing and the hand trades in

these years, as interpolated from census years, according to the general method pursued in finding the per capita holdings of land.⁵⁶

The results have little absolute value. They ignore the numerous persons engaged in hand trades, who have nothing to do with manufacturing concerns, and the establishments vary so widely in size and purposes as to be hardly susceptible of collective treatment. Yet these results are in correct relation, one with another. They have a meaning, therefore, and a brief survey suffices to exhibit its bearing on the discussion. Using a certain amount of license, we have assumed the final figures to represent the *Average Number of Persons per Factory*, and we observe that during these 14 years this number increased from 31 to 673 in Division I, in Division II from $6\frac{1}{2}$ to 12 and in Division III from 4 to 10 persons, and these gains in spite of the multiplication of machinery and the corresponding displacement of labor. Thus we are simply led by a different course to the same explanation of the falling off in numbers of establishments. It was the small and crude pioneer mills and asheries which were disappearing. The opulent industries were steadily gaining ground and multiplying.

Turning next to the detailed figures for the mills and concerns of similar character, it will be apparent that the decrease has been confined largely to oil and fulling mills, carding-machines, trip hammers, distilleries and asheries; that sawmills, cotton and woolen factories, iron works—especially the newer industries and those representing probably far the most capital and business—were flourishing and superseding the rest. Gristmills, generally second in rank through the different divisions, but slightly decreased. By their permanence and long standing they constitute something of a criterion, by comparison with which to judge of the growth of other branches of industry.

The case of Division I furnishes an illustration of certain of these typical conditions and changes. Although, no doubt, the average value of the production of a single manufactory was greater in New York City than elsewhere in the state, yet inspection reveals the fact that for 1835 this division supported

⁵⁶See table No. 40.

only one-fortieth to one-eightieth as many establishments as either of the two remaining divisions. In other words, the number of establishments is far from being a correct measure of the manufacturing progress or relative prosperity of a community. In Division I, also, the greatest numerical change from 1821 to 1835 is in the disappearance of asheries, and here likewise, the growth of the iron industry is particularly noticeable.

In Divisions II and III sawmills are the most numerous establishments, and in point of increase rank about third. At the conclusion of the period the number of these mills in Division III has increased over $1\frac{1}{2}$ times and there are nearly as many of them as of all the other manufactories covered under the ten classes and taken together. Although the average sawmill does not represent a large outlay, nor an industry continuous the year round, still these figures illustrate the relative growth of lumbering east and west, and especially in the western and newer region, where it had been so wonderfully stimulated by the intervention of the canal. Moreover, the depletion of the asheries, conspicuous throughout, so far from being a mark of retrogression, is a measure of the growth of lumbering on a negative scale. When facilities for transporting timber materialized, it came to be too valuable a commodity to burn for the sake of the ash. In that connection it is interesting to reflect that timber more than perhaps any other kind of raw material demands water transportation, and without that instrumentality will, in considerable quantities, rot in the forests, even during such stringency as in our day dominates the market. It is likewise instructive to remember that the sawmill was often, like the church and the schoolhouse, a distinctive, indispensable feature of the pioneer settlement. In fact, not infrequently the sawmill antedated the village and was the means of bringing it into being.⁵⁷

Continuing the study of the tables, it appears that a slight increase in the number of fulling mills and carding-machines prevailed in Division III, though the decrease in these two lines was quite pronounced in the other divisions. The two branches of

⁵⁷A list of towns in New York State in the appendix to bulletin No. 34 of the U. S. Bureau of Forestry, entitled, *A History of the Lumber Industry in the State of New York*, gives the dates of the first settlement and of the building of the first sawmill in each case. This list illustrates the intimate relation between the lumbering industry and the segregation of families into communities throughout the early history of the West.

industry remain, however, among the most largely represented in the several divisions. The distilleries and asheries were the most notably reduced generally, the iron works the most obviously prospered throughout, increasing over twofold in Divisions II and III and threefold in Division I. The cotton and woolen mills, on the other hand, multiplied one and one-half times only in Division III, but doubled in number in Division II, a circumstance interesting as contrary to the usual comparative rate of increase in the East and the West. Neither the iron works nor the cotton and woolen mills had become, by the end of this period, however, so numerous as several other classes of manufacturing establishments. The apparent feature of these returns is that the western district progressed more rapidly than the eastern, the total figures showing an increase in number of concerns for the West, but little short of a decrease for the East. It may be further suggestive to note that the nine additional classes of manufactories covered by the 1835 census had, no doubt, to a larger extent sprung into prominence since 1820, so that the increase among them would exhibit a larger rate than among those discussed.

It will be seen from the exhibit of numbers of the several manufacturing establishments that there is a marked uniformity in the per capita figures of Divisions II and III in 1835, the fulling mills, carding-machines, iron works and distilleries being in approximately the same relative abundance in the two sections of the state, while the sawmills, creditably to the development of the lumbering industry in the virgin forests rendered accessible by the canal, are even slightly more numerous in the West than in the East. And although the average number employed in a single establishment, indicating the average size of manufactory, is, at the concluding date, presumably greater in Division II, yet the numbers of establishments per ten thousand of the population in 1835 are rather favorable to the West, and the increase from 1821 to 1835 on that same basis is decidedly more imposing in Division III, that is, along the line of the great canal.

Number of Persons Engaged in Commerce and Navigation.

Period Treated—1820 to 1840.

In a sense agriculture is the fundamental occupation of mankind. Manufacturing partakes strongly of this primary character also; but that third employment to which we now direct our attention, commerce—the intercourse between communities—is most of all a parasitic industry, whose growth always springs from some ulterior and more fundamental source. Commerce is not directly a productive agency and it flourishes only because of productivity somewhere else, whether within or without the state. Yet not only is it retroactive in the service and stimulus it affords that productivity, but, being practically necessary to a civilized people, is allowed a commission, so to speak, on the original yield, and that commission it distributes among its followers so as to constitute quite as acceptable an income as if derived immediately from the soil or the mine—the elementary principles, or the raw material of Nature.

As already explained, the scope of the term commerce in 1820 is uncertain, though probably covering the ground of both commerce and navigation in the 1840 census, whence, although comparison has been made both on this assumption and on the second hypothesis that the term commerce, as used in the two years, has the same signification, yet the first or broader interpretation is given greater weight in the discussion. It is to be understood that the treatment of the totals under the column-heading, *Navigation*, relates to the sum of the figures for commerce and navigation in the year 1840.⁵⁸

First, it will be seen that the percentages of population engaged in commerce are comparatively small throughout, being of course largest in Division I, where five per cent of the people are, in 1840, engaged in commerce and navigation, a percentage twice as great as in 1820. The largest percentage-gains are in Division III and more specifically in Subdivision III-A, the absolute gain per 100 of the population being practically the same there as in Division I, on the first, though somewhat less on the second hypothesis.

⁵⁸In connection with this subject see tables Nos. 23 and 26 for data, and Nos. 33-37, inclusive, for deductions.

Furthermore, the larger gains are in the border towns rather than in the more remote zone, which is as would be anticipated. The smallest initial figures are those for the western B belt, showing 2-10 per cent of the population as engaged in commerce, although only 3-10 per cent are thus engaged in the corresponding A belt. In 1840, however, the western B belt has only 6-10 per cent at the most favorable figure, but the percentage of the population of the A belt engaged in commerce is five times as great, or in commerce with navigation seven times as great as in 1820. The figures of Division III increase from 4-10 in 1820 to 8-10 in 1840, of the average figures for the state; and this on either basis considered. Still, at the same time, the rank in this respect of each, Division I and Division II, is slightly lowered.

In terms of percentage-increase we have for Division III nearly 600, or on the more probable hypothesis over 900—that is, the numbers commercially engaged in 1840 were tenfold those engaged in 1820—decidedly the most striking of any similar figures throughout the triple schedule of employments. The comparison, too, is the more favorable to the West, when the splendid commercial facilities of the Hudson are considered, and when it is remembered that the eastern inland belt, so-called, includes the maritime counties of Suffolk, Nassau, Queens and Richmond.

Division III, on the first basis treated, has practically the same percentage of its population employed in commerce in 1840 as has Division II, notwithstanding the smaller percentage of persons engaged in the three gainful occupations in the West; and, were the two counties of Suffolk and Richmond excluded, the percentage of those engaged in commerce and navigation for Division II would be likewise reduced to a parity with that of Division III, while comparing only the A belt east and west in 1840, these absolute per capita figures are seen to be, on the more probable assumption, 50 per cent greater for the West. Yet obviously the B belt west is less given to commerce than the B belt east, a condition which is not only due to the omission of the A belt through the maritime counties, but to the equalizing influence of the item of ocean navigation. Pre-

sumably figures based on this item vary in general according to the distance from the coast, Belt A being for some ways upstream nearly indistinguishable from Belt B in this respect. That the density of commercial population varies according to the distance from the waterway more largely in the West than in the East, again tends to fix upon the canal the responsibility for the phenomenon with greater appearance of certainty.

Indeed, it would be difficult to produce a more brilliant and convincing testimonial than these statistics present, if they have been interpreted aright. They furnish a picture, in 1820, of a relatively well-established and thickly-settled strip of territory bordering one of the grandest of our navigable rivers, extending from the best ocean harbor on the continent one hundred and fifty miles inland to the limit of tide-water, and thence stretching along the shores of a generally navigable tributary, the fertility of whose valley was world-famous; and they present as a contrast to this strip another, extending westerly from it through a frontier country, sparsely populated, remote from the sea—a strip which was at an early date less populous than the adjoining land, commercially insignificant and possessing no conspicuous facilities for navigation or commerce, nor even distinguishable from the neighboring country by any demarkation save the imaginary line of a canal through its midst. In the comparatively brief period of twenty years the second strip had eclipsed the first and had become, even to a greater extent than the first, devoted to commercial pursuits. Whatever may have been the fundamental essentials, such as fertility of tributary area and predetermined trend of population, the canal, as the only transporting agency worthy of the name, was so clearly indispensable to the efficient exploitation of these fundamentals as to be deserving of the principal credit for the transformation which visited its shores.

General Discussion of the Triple Schedule of Occupations.

We have, up to this point, considered separately the three or four branches of the schedule of employments and it behooves us now to examine the relations of these occupations among themselves. It will be seen that the eastern division has a larger percentage of its population engaged in gainful occupations than

the western and this difference is enhanced in 1840. The circumstance affects somewhat our comparisons and is probably not to be accounted for by the supposition of more females than males, since the latter are usually in excess in a new country. Yet as celibacy tends to flourish and size of families may be supposed smaller in a well-settled district, the phenomenon of a smaller percentage gainfully employed in the West may be possibly due to the prevalence of these conditions, especially in 1820. The same conditions may have held in 1840, because of the less productivity of the East more than compensating for its smaller density of population. If a larger family could be supported on a western farm, it was testimony both to the inherent virtues of the soil and to the facilities making the output of that soil marketable.

Resuming the study of the several divisions, we infer that these three vocations relatively occupied a greater number of the inhabitants in Divisions II and III, where the total percentage of the population thus employed amounted to nearly 30 in each case, than in either New York State or City. In New York City (Division I) the percentage was approximately 20.5 and we find the difference of about 10 per cent accounted for by the insignificance of the agricultural industry and the greater diversity of occupation in the city, to which the triple schedule of the census does not do justice. We find that in Division I figures for all these three items increased by some 400 per cent, yet manufactures less rapidly than commerce and navigation (on the more reliable hypothesis). In Divisions II and III, separately, as in the state at large, agricultural numbers increased least, manufacturing more rapidly, and commercial most rapidly of all. The progress of Division II bears the semblance of a "lag effect" of the progress of Division III. For the numbers engaged in agriculture in the West increase by as great a percentage as those engaged in manufacturing in the East, and those in manufacturing in the West as rapidly as those engaged in commerce and navigation in the East. The several items of percentage-increase stood in the relation of 3, 4 and 10 in Division II, but of 4, 10 and 37 in Division III, always considering commerce and navigation as a unit. Thus again is emphasized the commercial prosperity of Division III.

A few general remarks on the conditions and growth of the state as a unit may perhaps serve to interpret the industrial conditions and illustrate the essence of some of the relations we have attempted to trace in detail. It will be observed that commerce as an occupation absorbed the interests of the people to a far greater extent in 1840 than in 1820; that in fact, where in the earlier year less than 66 in every 10,000 of the population was thus engaged, there prevailed in 1840 on the average nearly three times that proportion engaged in commerce and navigation. Instead of 440 per 10,000 as in 1820 there had come to be in 1840 a manufacturing population of 710, on the same basis. And even in the field of agricultural enterprise there were now 1,880 persons instead of 1,800 distributed through each group of 10,000 of the total population, thus indicating an improvement during the two decades.

We observe that in the state the increase is thus throughout most favorable for commerce, next for manufacturing and least of all for agricultural pursuits. When the relative magnitude of the several industries is considered, however, the order is reversed. Of the several items we find agriculture giving employment to three or four times as many persons as manufacturing and from 10 to 30 times the numbers engaged in commerce. Yet, in the pursuit of agriculture, there were at work in 1840 only about 19 per one hundred of the population, so that all three classes do not represent more than 28 per one hundred of the population, male and female, in that year. The relative importance of the very slight increase or decrease is, however, magnified for this very reason.

Assessed Valuation of Property.

Period Treated—1820 to 1835.

There is still one subject which is often regarded as a prime index to social progress and which we proceed to investigate.

Data on valuation are subject to the considerable fluctuations of the money market and thus present a somewhat treacherous source of information, especially where a single year is accepted as representative of a period, or where statistics for years in different periods are compared without a recognition of the shift-

ing currency. Assessed valuation, moreover, is not a product of the application of scientific principles of measurement, but rather the aggregate verdict of varying judgment. It is seldom even identical with the full estimated market value. Yet valuation commonly rises with prosperity and is a useful indication, at least, in all comparisons.

We have seen already that the year 1822 marks a minimum stage in the period of decline in assessed values of New York State property and that this year is followed by an increase continuing with hardly a serious interruption to the present day. That fact in itself is of absorbing interest in connection with the study of the period which we discuss and the forces directing the progress it exhibits, and therefore we are glad to investigate more in detail the phenomenon of increasing valuation between 1820 and 1835.

It will be seen by reference to table No. 22 that the *real* property throughout greatly exceeds the *personal* in assessed valuation—a normal condition—and further that the percentage-gains are much superior in the personal class, especially in the western district. The largest percentage-increase of real property is found in Division I, of personal property, in Division III.⁵⁹

Division I is seen to possess, as would be expected, far the largest per capita valuation, and yet its growth from immigrating aliens and the impecunious classes is evidently such that it does not keep up with the state in percentage-increase of personal property. Its splendid prosperity and relative importance may be appreciated, however, from the fact that the mere increase in valuation per capita during the period under consideration is, in the case of real property, somewhat in excess of the full valuation in 1835 of either of the other divisions, and far in excess of the other divisions taken together, in the case of personal property.

In Division II the real property makes a poorer display and the per capita valuation is considerably less in 1835 than in 1820. Even the personal property does not increase as rapidly as for the state, but enough to double the per capita valuation.

⁵⁹See for data table No. 22 and for deductions Nos. 33-37, inclusive.

In Division III the increase is, throughout, more marked than in Division II, yet neither final figures reach those of that division, the personal being \$21 as compared with \$42.50 for Division II, and \$261 for Division I, the real \$144, \$153 and \$568, respectively. Yet its per capita valuation of personal property in 1820 was but \$5.10, so that this figure is quadrupled. In both real and personal property it has increased its relative standing in the state.

We are unable to ascertain the township valuations at the earlier date, and therefore must omit the attractive study of valuation according to the distance from the canal, yet this could hardly fail to confirm other results derived and must needs show an abnormally high valuation in the townships adjoining the canal. What our tabular review does attest, however, is the magnificent proportions of the growth and estate of the city represented by Division I, the history of whose existence dates back of that period nearly two centuries, yet the valuation of whose property increased in this decade and a half by 250 per cent and thus at least trebles if it can not be said to quadruple, and whose population, though multiplying faster than that of any of its New World competitors, yet lags far behind its properties in their enhancement. The figures display a coincident phenomenon pertaining to that section of the "up state" we have denominated Division III, differing only in the smaller beginnings upon which a like stimulus operates. That its increase in real property valuation more than keeps pace with the growth of population is alone noteworthy, especially when it is observed that the eastern division loses in its real per capita valuation during the same time. Yet when we consider that the average individual holdings of personal estate are quadrupled and reflect that the influx of population has not been from among the ranks of established wealth but rather of "honest poverty," we are prone to acknowledge the potency and beneficence of the influences, which have enabled the average man to become four times richer in the commodities of life—to live, as it were, four times more comfortably.

Recapitulation of Statistics.

We undertook the foregoing statistical examination of New York State with the avowed object of measuring on different scales the influence of the canal, of tracing the penetration of that influence and the range, as well as the magnitude, of its ramifications. Therefore, we pause in an effort to place clearly before the reader the several ways in which the statistics already presented bear witness to this influence.

First, we have ascertained that New York State and the three divisions most affected by the canal were increasing in population but slowly in the earliest portion of the period which we discuss, and that New York City was actually decreasing and even through the period of 1814–1820 continued to lose in its relative standing in the state.⁶⁰ Following this period of slow progress, we recognize a marked acceleration imparted to the growth of the state and the three divisions, causing a much more rapid development throughout the remainder of our period than in other portions and in other states, which had hitherto paralleled or surpassed the State of New York in her career.⁶¹

We see, during the double decade following the first opening of the canal, some peculiar features characterizing the progress of the several divisions, in the mean of all of which the wonderful but complex growth of the Empire State consists. We discover, indeed, a striking growth of all sections in all important respects. That circumstance, however, is too general to serve our purposes. We desire to localize the issue, to focus the consequences back to their origin. In our effort to realize this aim we have detected numerous pronounced eccentricities of growth as a direct outcome of the canal, as, for example, in the unprecedented increase experienced by Syracuse, Rochester and Buffalo, and a host of other cities and towns along the great waterway, and in the well-attested transformation of their sites, their industries and their tributary territory—all of which is historic and incontrovertible.

Again, we have observed that in 1814 the only data accumulated for that early period, namely data on population, show the border townships along the line of the projected canal in the western

⁶⁰See plate No. I (upper diagram); also plate No. II.

⁶¹See *Discussion of Plate No. V* farther on in this chapter.

section inferior in development to the townships back of them.⁶² In 1821, too, the percentage of improved land is greater away from the canal; and in 1820 the percentage of aliens and the percentage of the population engaged in commerce are both substantially the same throughout the western border counties, irrespective of the distance away from the canal line. It is hardly necessary to add that, while by contrast the border and inland towns of the East maintained throughout the same general relations, and indeed in population and agricultural statistics at least increased in parallel courses, yet in the West the border towns, increasing from early canal days with altogether disproportionate speed, had, at the conclusion of the period, in all respects save perhaps that of agriculture, attained a higher standing relative to the rear belt than that which the border towns in the East occupied with reference to the corresponding rear belt, or strip, more remote from the waterways.

With respect to the aliens it is likewise significant that the increase throughout the state has been striking beyond all comparison. The attraction of the steamship lines to New York City—in itself, apparently, more or less a consequence of the canal traffic—is partially responsible for this unique aspect of progress and expansion. The brilliant prospect awaiting the settler in the “up state” was perhaps the chief element, however, serving to entice the foreigner and to restrain him from further journeyings in a westerly direction. All this we have discussed. Yet it is worthy of consideration again that the density of alien population might, for many reasons, be expected to increase in passing from the seacoast to the frontier, as it actually did in New York State in 1820; and thus it is suggestive to demonstrate that twenty years later there existed a percentage of alien population appreciably greater in the border counties west of the head waters of the Mohawk than east of this same divide.⁶³ That is to say, where the effect of the canal operated more powerfully, there the incoming foreigners settled, disregarding the law which would otherwise have governed their distribution. Are we not compelled, therefore, to award some measure of acknowledgment to the canal, that greatest of the internal improvements of the era,

⁶²See plate No. III; also plate No. IV (upper diagram).

⁶³See plate No. IV (lower diagram).

for inducing the immigration which has since steadily increased and has exercised so potent an influence in its turn upon the development of our nation and our national economy?

Indeed, in all those features where the influence of the canal is most keenly felt, however great or small that influence may be, the progress of the period is the most abundant and the splendor of the age the most illustrious. If it be a question of occupations, then we turn to the commercial pursuit as the livelihood most likely to be subject to the influence of the canal and discover that in this, as in no other of the three grand vocations enumerated, men found increasingly attractive and lucrative employment. Or turn to the consideration of locality, and from whatsoever direction we approach the canal or the waterways leading into it we encounter greater and greater density of population and increasing intensity of development and rapidity of multiplication in all the productive capacities in which the "Federation of the World" is busied—this with scarcely an exception. Where there is an exception it appears to be always trivial in character or else it relates to that occupation having the least direct susceptibility to the local services of a trunk waterway, namely, the pursuit of agriculture.

Or again, to carry this consideration of locality a step further. we recede, in our study of the census, from the coast towards the lakes. When we have left the great distributing point, the City of New York, and its environs—when past the ancient valley of the Hudson and up the Mohawk and then at length in the heart of the newly-settled region, we pause. The journey reveals a paradox. As the settlement becomes more recent, the density and business activity increase. The western shores of the new artificial waterway, before that waterway was in operation, contained a relatively insignificant population, both native and alien, and constituted the minimum of the three divisions in development of land and of manufacturing and commercial industries. Now, at the close of the period, this belt is the peer of its eastern territorial counterpart in valuation of real property per capita and in percentage of population engaged in navigation, surpasses it in the abundance of sawmills and gristmills, the percentage of aliens, the percentage of population engaged in commerce; and has actually far outstripped the eastern belt in density of popu-

lation. And the time required for this transformation is, generally speaking, less than twenty years.

Thus it is that whatever domain of industry or section of territory would appear to be most susceptible to the effects of the canal for progress or retrogression, that field of human enterprise exhibits during this canal era, as it were, the maximum of prosperity and vigor and growth. Thus it seems to be needful to ascribe a wide influence to the canal, and to that influence the attribute of beneficence in a liberal degree.

Of New York City we have seen previously how superior was its growth to that of its competitors, that were, but whose rivalry it had outgrown by the end of the period. We have here only the same story to read again with new illustrations. Division I had a maximum increase among the several divisions in its absolute figures, almost without exception. It increased its percentages engaged in manufactures and in commerce and navigation by the maximum figure, virtually doubling those percentages in twenty years. Its iron works and cotton and woolen mills multiplied as did no others in any section of the state and it laid at this time the foundations not only of its commercial and financial supremacy but of its manufacturing importance and its unique, cosmopolitan growth.

We have seen how in the western part of the state the farms apparently increased in size as the facilities for transportation improved and the market was thereby enlarged, causes which, operating collectively, led to the development of specific crops, like the wheat crop, to an extent heretofore unknown, until in 1840 nearly one-third of the state was under cultivation. We have seen, too, how much greater was the stimulus invariably afforded during the period to commerce and manufactures than to agriculture, how the towns adjoining the canal and river possessed, relatively to other districts, greater commercial and manufacturing than agricultural interests and increased more rapidly in the former, while in respect to agricultural increase the neighboring rear towns surpassed them. And, from the point of view of a hundred years ago, we have been able to forecast something of the condition of our proud, imperial State today, had it been deflected in those early times rather to agricultural than to commercial pursuits. In order to make that prophecy, we have

studied incidentally the law of growth of the agricultural community. In the eastern part we have seen it exemplified. There has taken place, apparently, a decrease in size of farms, and there the average density for the period is the greater. Thus we conclude that the decrease is the result of an overcrowding and is a signal for a decline in rapidity of growth. Again, we have, pictured before us in the figures from 1840 to 1900, the low, retarded rate of growth of the rural district (such as Division IV) after reaching a moderate density of population, as compared with the rapid, vigorous increase of Division III, or even the less active Division II, and in that contrast we perceive to what lasting and preponderating advantages our state has fallen heir in her commercial preeminence, which she justly ascribes in so large a measure to the intervention of the canal.

Yet withal, we ascertain that throughout those early canal days the gains in agricultural interests were the rule and losses the exception. If the diversion of agricultural prestige from our own farms to those of the West be charged against the canal, it is only fair to remember the splendid impetus given to the cultivation of grains and the flour trade and the like in the country opened up by the Erie canal, and to reflect that, not until the era of railroad-building, did the supremacy of these industries in New York collapse and the agricultural interests of the state enter into serious and damaging competition with the greater West—an occurrence no public policy could long have postponed. Indeed, this was a "Golden Age," when there were practically no decreases, the determination of the progress of which resolves itself into a study of differentials, a selection of the superlative from amidst a concourse of comparatives.

Thus while the state was increasing abundantly, the eastern section was increasing at a less rate generally and the western at a greater rate. Not only in density of population, but in its manufacturing and commerce, and in its valuation of real and personal property, so far as our data extend, Division II exhibits a growth inferior to that of the state as a whole, and even in its improved land per capita the former fails of a more rapid increase than the latter. The real growth of the division—the prosperity of that which remained to it—was commendable, but much of the stimulating effect of the age was obscured by the heavy

draught made on the East to develop and prosper the West. In the West the conditions were reversed. Division III, which in the early years had been an inland agricultural belt so far as it was settled at all, had risen to greater commercial prominence than the border counties along the natural waterways—the Hudson and the Mohawk rivers—and had surpassed Division II in its per capita gains of density of population, numbers engaged in manufactures and in commerce and navigation, numbers of aliens and valuation of real property. Its percentage-increase was greater in the size of its farms and of its manufacturing establishments. This division increased during that period as fast as New York State in agriculture and more rapidly in all the other considerations, and it is today what the canal indisputably made it in the formative era of its infancy, the flower of the “up state,” a most distinctive, illustrious and imposing memorial to the influence of that Father of American artificial waterways, the Erie canal.

FURTHER INDICES OF THE INFLUENCE OF THE CANAL.

Discussion of Plate No. V.

Using the data we have, up to this point, collected and discussed, we are now able to give a somewhat more comprehensive and specific statement of the relative progress of all the states and the various local divisions of territory which we have studied. On the basis of population we desire to compare the growth of all these sections. Obviously, a direct comparison of census figures before and after the canal would have little meaning; and we have, in foregoing pages, explained the disadvantages of comparison, on the one hand, of percentage-gains, which are normally high in any newly-settled district, and, on the other hand, of figures showing absolute increase of density, inasmuch as the latter will be naturally low in any newly-settled locality and relatively high in any older community. Thus we have to seek a standard for comparison, which gives due weight to both these elements, namely, rapidity of multiplication and mere volume of increase, neither of which alone is an unfailing criterion.

The case has many counterparts, however, in the field of scientific mensuration. The measure of a force is the product of the acceleration it produces in any body and the mass of the body on which it produces that acceleration. Reasoning from analogy,

therefore, we have assayed to measure the real growth of a region by the product of its average density and its percentage-increase during a given period. We have taken a succession of such products as derived in table No. 19 and represented them to scale on plate No. V in the order of diminishing magnitude.

Plate No. V, therefore, exhibits in the most rational way the comparative growth of the country during early canal times; and because merely verifying in a striking manner many of the conclusions which we have heretofore drawn, it does not require extended discussion. The noticeable features are that Division III (the western counties of New York, bordering on the canal) presents a more favorable showing than any other section of the United States, that Michigan (the state next to New York most affected by the transportation facilities provided by our great waterway) ranks second in the list and first among the states of the Union, that the three other border states on the lakes follow immediately after Michigan, and that, except for Massachusetts, the State of New York stands next. Thus, with this one exception, which we have in previous pages explained, New York heads the list not only of the older eastern states, but of all those remaining, including the new states of the South. It is further interesting to note the relative standing of Divisions IV and II, the latter through the drain of emigration westward tending to keep down the record of the state at large. All in all the diagram is an impressive epitome of the influence of the canal.

Articles Transported on the Canal in 1824 and in 1834.

There is a subject omitted from our statistical study thus far, which has an important bearing on the condition of the country and measures to a certain extent the effects of canal-building, and we therefore proceed to a more intricate study of the products of the state, although we have heretofore used certain of the well-known facts which this study establishes. In the absence of data previous to the census of 1840 relating to the productivity of the several regions of the state—the specific crops and their distribution—we have attempted to obtain from the detailed figures of canal movements through the several years some view of the change in kind and magnitude of production. There

are only desultory records preserved to us of the traffic on the canals in the years previous to about 1835. These records are generally complete for clearances and arrivals at West Troy (on the Erie and Champlain canals) and at Buffalo, and there is a continuous record up to the year 1835 of the passages at Utica in both directions. There was also kept during many of those years a register of shipments passing Whitehall on the Champlain canal, and now and then a separation was reported of the goods shipped to and from points west of Buffalo and out of the state.

From such scattering records we have compiled tables Nos. 41 and 42 for two years, 1824 and 1834, the years of that early period in which the availability of all items incident to the discussion obtain to the greatest extent. In 1824, at the beginning of the period, all but about eighty miles of the canal had been opened, so that the western section had been well penetrated, but the shipments on the canal as yet practically all originated within New York State. It was necessary even in those years, however, to estimate or neglect the changes in the character of the traffic between Whitehall and West Troy on the Champlain canal and to approximate from extraneous data to the portion of the Buffalo receipts and clearances with which other states should be credited. The original records being, likewise, in standard denominations, such as prevail for the particular articles—some in dry measure and some in liquid, some linear and some volumetric—it has been necessary to reduce all figures to common terms of 2,000-pound tonnage, and necessarily, too, some approximation has been here involved. The various stages in the process of reduction are reproduced, or indicated at least, in the tables.

The columns headed *Out-of-state, Erie and Champlain and Utica, East and West* are fundamental and are believed to be accurate. The ultimate deductions under columns, *Total Erie, East and West* and *Output of Division III* are subject to not a few uncertainties, yet the most doubtful elements entering into their composition enter gradually through the factors of the least relative magnitude. The doubtful out-of-state data, for example, were of comparatively small importance in 1834 and the uncertain tonnage on the Champlain was by far the minor portion of the total tonnage for both canals taken together.

Thus, with the preliminary warning that literal precision is not to be imputed to the data on which our study is based, we may proceed to compare the traffic in the early days of the canal and that at the close of the first decade.

In order to undertake this discussion the more readily and to pursue it more clearly, the results have been embodied and amplified in table No. 43, which is self-explanatory. A glance over the last-named table will emphasize the fact that a very marked increase took place in the detailed movements between the years 1824 and 1834. Many new articles of transportation appear and shipments of staple goods had increased abundantly. It is of little interest and significance, however, to note that the forest products were shipped in quantities seven to eight times as great in 1834 as in 1824, and others increased in ratios almost as striking. The uncertainty with reference to the conditions in the earlier year and the knowledge that the last section of the canal through to Buffalo was still closed, vitiate the apparent significance of such data. But it is the purpose of this study rather to point out that, for example, products of the forest increased most of all the general classes. Of agricultural products those pertaining to animals increased with the least rapidity, while the vegetable foods and vegetable products generally made striking gains. Such figures are not to be taken as indicating altogether the variations in the productions of the districts. It is clear that perishable butter and cheese would not admit of the ease of handling and time of shipment which would favor their adaptability to canal transportation. Lumber and wheat and grain were more suitable to that purpose and their cultivation more largely stimulated through the facilities provided by the canal. There is, however, the opposite point of view, namely, that, since the canal stimulated industries depending on these bulky, non-perishable products, they might rationally be expected to show a superior increase of production.

When a detailed inquiry is made, it becomes apparent in the comparison that the lumbering industry has been exceedingly benefited. There is considerable question as to the integrity of the figures which appear under the items *timber* and *lumber* in the final columns, entitled *Erie, East and West*, but inspection

of the fundamental columns, numbered (1), for the two years will demonstrate beyond a doubt that the ratios of the figures for 1834 to those for 1824 are relatively very large, and the more reliable column, entitled *Output of Division III*, exhibits ratios many times larger yet. Of the several items of *forest products* it will be seen that timber is the most conspicuous, and yet that the increase in lumber transported amounts to a great deal more in absolute figures, this constituting generally the largest proportion by weight of the traffic in forest products. The raw materials of the industry—timber and corded wood—make up together the smaller proportion by weight of the traffic in forest products. This circumstance is the rational outcome of the fact that the logging is done where the forests exist, largely nearer the head waters of the streams, and that before reaching the canal this raw material has been prepared for market by the sawmill. Yet in those early days the canal and its tributaries did penetrate many heavily timbered tracts and numerous rafts of logs floating along the canal towards the Hudson river constituted a familiar sight, we are told, to the observer of half a century ago. Thus the amount of raw forest products transported was, after all, not inconsiderable. The canal indeed furnished a great impetus to the lumbering industry by penetrating the newer regions, by connecting with the numerous streams and by supplying a type of transportation facility almost ideal for the needs of the traffic; and the rapid multiplication of sawmills, especially in the western part of the state, testifies to this stimulus.

Although the lumber industry deserves first rank in the magnitude of its several classes of shipments and in its relative increase, yet if the sum total of all *agricultural products* be considered, the amount of the latter is not inferior either in 1824 or in 1834, and one of these agricultural products stands conspicuously in the lead among all the articles shipped upon the canal. That product is flour. Its shipments have multiplied seven times in the ten years, and in 1834 constitute from twenty to thirty per cent of the total movements. Naturally wheat has increased—though because of the development of local milling interests, in less degree—and coarse grain exhibits a wonderful improvement.

Passing from the lumbering and agricultural to the *manufactured products*, we are impressed with the paucity of the latter

and their slender growth during the decade. There is a partial explanation of this circumstance in the fact that the two previous classifications cover the output of the most numerous manufacturing, namely, sawmills and gristmills, as well as some others. The factory products, too, are not bulky, though of greater value. They will thus sustain a higher ton-mileage rate and so are less favored by canal facilities.

Merchandise, a somewhat equivocal term, took the first rank among all items, as will be seen, in 1824, the magnitude of shipments thus classified being greater in that year than of flour or lumber. Yet in the course of the decade it did not increase with such rapidity as to retain this standing. The shipments of *domestic spirits* increased largely. The figures for *salt* are of uncertain derivation and probably do little justice to the traffic in that article, the invigoration of which both at the Onondaga salt springs and later in the more westerly district was a notable achievement of the canal service.

The item *furniture* comprises largely household goods and thus reflects to some extent the stimulus given to emigration from the East. Both furniture and merchandise are principally return, or westbound, shipments and a large proportion of each passes out of the state. From an examination of the fundamental columns a more reliable conception of the benefit thus afforded the manufacturing along the canal and in New York City may be obtained.

The columns relating to the whole traffic of the Erie canal and to the traffic west of Utica are largely corroborative, the one of the other. There appear to be no sharp contrasts, unless it be that the output of Division III exhibits a far more favorable increase in respect to *timber* and *shingles*. The total of forest products, however, is not markedly greater for Division III than for the entire section. The fact is noticeable that the percentage-gains for Division III are, throughout the agricultural and forest products, materially greater than for the entire canal. The more rapid development of the western section is thus verified anew.

Finally, our survey of these tables would not do justice to its exhibit, were we to ignore the great average percentage-increase of the traffic during the decade, namely, more than 350 per cent. That eighty miles of the canal was still unfinished implies an error of little relative significance. That, exclusive of out-of-state traffic and of a thrifty way traffic, there was passing West Troy

from or for the Erie canal in 1824 less than 100,000 tons and in 1834 probably half a million tons—and this the product of a single decade—is interpretative of the benefits of the canal to the producers and consumers of the community and to the nation which they served and among whose citizens they were numbered.

Specific Instances of Growth along the Canal, especially the Rise of Cities.

Perhaps the most striking and dramatic feature of the influence of the canal, and that upon which historians have most delighted to dwell, is the growth of thriving cities along the borders of the waterway. This fact is a mere corollary, not only to the other fact of the remarkable celerity with which mills and factories sprang up and the spinning-jennies and power looms became abundant, but also to the circumstance that extensive areas were being cultivated with grain for the mill or devoted to the production of dairy products for the market, that, in view of improved transportation facilities, the market for local goods came to be the whole sweep of the coast, not merely the immediate community, and that, therefore, commerce was greatly stimulated and the inland villages became shipping centers and grew by mammoth strides. The picture of this growth resembles the ancient myths. It suggests the plain, which, sown with dragon's teeth, suddenly became alive with an army of men.

In order that the fact may serve those who in future would draw inspiration from the past, it must, however, be well proven and well stated. With this object in view we turn to consider the statistical facts. In Professor Tucker's *Progress of the United States in Population and Wealth*⁶⁴ is to be found a table exhibiting the percentage-growth of the urban population of the country during different decades. From this table it appears that, of the towns having 10,000 inhabitants or more in 1840, there was none in the United States which during the decade 1820-1830 increased as did Rochester, N. Y. That town gained 421 per cent of its initial population during the period, and Buffalo followed second in rate of increase, with 314 per cent. Syracuse seems to have been third (although, probably on account of

⁶⁴Published in 1843, see p. 128.

its late separation from Salina, in 1847, it does not appear in this table). Its gain was 282 per cent. Utica was fourth in the United States, showing an increase of 243 per cent. Even Troy was exceeded in percentage-growth only by the western cities, Louisville and Cincinnati. The subject of the growth of these and other towns along the canal, which today constitute probably the most conspicuous and compact chain of cities in any part of the country, is, especially during this period, inexhaustible. We may, however, touch upon the impressions created upon contemporary travelers and writers by such bewildering growth. Contemporaries may be eye-witnesses and thus, although sometimes over-impassioned, merit an attentive hearing.

From the *History and Geography of the Mississippi Valley*, written by the Rev. Timothy Flint, in 1832, we again quote: "New York, in its whole extent, especially the western part, offers a sample of this order of things particularly to those, who can remember, when the country on the line of the canal, and the beautiful country of the small lakes was all a continuous and unbroken forest. Rochester rises, a proud index of the astonishing changes wrought in this country in a few years."⁶⁵ And again: "Rochester . . . has had the most sudden growth of any town in America. In 1812 it was one wide and deep forest; . . . Genesee flour, unknown before the existence of the great canal, in New England, is now the flour of general consumption there."⁶⁶ In confirmation of this account it may be said that in 1816 "there were but 331 people where the City of Rochester now stands." Though not incorporated as a village until 1817, it had become by 1838 the shipping point for the wheat of the famous "Genesee country," and, according to statements of contemporaries, the "largest flour-manufactory in the world."⁶⁷

Goodenow's *Topographical and Statistical Manual of the State of New York*, published in 1822, contains the following:⁶⁸ "Syrac-

⁶⁵*History and Geography of the Mississippi Valley*, Vol. II, p. 15.

⁶⁶*Id.* p. 52.

⁶⁷*Sketches of Rochester*, Henry O'Reilly, pp. 30-31, 34. (1838.)

In 1810 De Witt Clinton visited the site of Rochester and later stated that there was not a single house there at the time. In 1812 two rude frame dwellings marked the site. See *Id.*, p. 29.

In consequence of the canal, the boat-building industry grew into prominence throughout the state and centered at Rochester where "numerous extensive boat-building establishments" bore witness to this activity. See *Id.*, pp. 31 and 332. For history of the flour trade of Rochester, see *Id.*, p. 360, *et seq.*

⁶⁸Page 21.

cuse, Buckville, Jordan, Brutus (at Weed's Basin), Canastota, and other villages have already arisen on the borders of the canal since it was commenced." The "village" of Lockport "contained but 3 families on the 29th of July last [1822]. On the first day of January last (5 months later,) it contained 2 apothecary shops, 4 stores, 5 taverns, sundry groceries and victualling houses, (making 50 buildings in all) and 337 inhabitants, with a regular weekly newspaper!!"⁶⁹

It is hardly necessary to multiply instances. The fact is well known that the canal made Buffalo⁷⁰ and gave it a terminal trade such that today its twenty-eight huge elevators⁷¹ constitute an industry of giant proportions in itself; such that Tonawanda is still, next to New York and Chicago, the greatest shipping point of lumber in the United States. Col. Stone, formerly editor of the *New York Commercial Advertiser*, found Syracuse in 1820 to be "a few scattered and indifferent wooden houses . . . erected amid the stumps." "It would make an owl weep to fly over it,"⁷² he declared. Any historian of Syracuse will ascribe the birth of that city to the salt production of the Onondaga Springs and will attribute the principal development of the salt industry to the Erie canal.⁷³ Farther east the cities of Utica, Albany⁷⁴ and Troy⁷⁵ acknowledge in the opening of the Erie canal an epoch-making event, charged with immense benefit to them.

⁶⁹The growth of Lockport was quite largely due to the supply of water from Lake Erie furnished by the canal for hydraulic purposes, thus illustrating another source of benefit from the canal construction and operation.

⁷⁰"The construction of the Erie Canal—an event bearing about the same relation to the future of Buffalo as the discoveries of Columbus to the history of America." Address of Hon. E. C. Sprague at semi-centennial celebration of the City of Buffalo (1882).

Buffalo is said to have contained 200 inhabitants when burned by the British in 1812.

⁷¹"I began the work of erecting the building on Buffalo creek, at the junction of the Evans' ship canal, in the autumn of 1842. . . . I believe it was the first steam transfer and storage Elevator in the world."—Joseph Dart in *The Grain Elevators of Buffalo*; see *Buffalo Historical Society, Publications*, Vol. 1, p. 401.

⁷²This remark was addressed to Joshua Forman, whom a local writer fondly styles the "Father of the canal and of Syracuse." Col. Stone further says: "With the completion of the middle section of the canal Syracuse was begun." See *Reminiscences of Syracuse* by Timothy C. Cheney, published by the *Syracuse Daily Standard*, p. 19. (1857.)

⁷³The amount of salt inspected in the "town of Salina" was as follows: in 1805, 154,071 bushels; in 1815, 295,215 bushels; in 1825, 768,188 bushels; in 1835, 2,209,867 bushels; in 1845, 3,762,358 bushels. The rapid increase between 1825 and 1835 exhibits the stimulus due to improved transportation and enlarged market. Figures are from Joshua V. H. Clark's *Onondaga*, Vol. II, pp. 27-28. (1849.)

⁷⁴The canal brought to Albany an immense terminal trade and during the middle part of the last century its docks were thronged with seagoing craft. By 1834 it had become "the greatest beef-packing center in America" through the influence of the canal; and it became also the great lumber depot, and continued as such until the gradual depletion of the eastern forests.

⁷⁵Previous to the completion of the Erie and Champlain canals, the business of Troy had been mostly confined to its immediate vicinity, but with the opening of these important water

Table No. 18 serves as an interesting study in this connection. It enables the reader to verify much that contemporaries and subsequent writers have asserted in regard to the sudden and pronounced increase of population of the cities and towns in the canal belt during the early years of the operation of that waterway. In conjunction with the following table it also enables him to note the extent to which this stimulus, imparted in 1820 or 1825, has continued to the present time. This last-mentioned table exhibits the rank of the cities of the state, containing over 25,000 inhabitants in 1900, among the cities of the United States. Three of these cities, it will be seen, fall below the rank of 100; all others well within that number. These three are interior cities, having no water communication. The remaining nine lie upon the one great through waterway from New York to Buffalo.

TABLE OF CITIES IN NEW YORK STATE CONTAINING OVER 25,000 INHABITANTS IN 1900.

CITIES.	Population.	Rank among U. S. Cities.†
Albany.....	94,151	43
*Auburn.....	30,345	139
*Binghamton.....	39,647	101
Buffalo.....	352,387	8
*Elmira.....	35,672	117
New York.....	3,437,202	1
Rochester.....	162,608	24
Schenectady.....	31,682	83
Syracuse.....	108,374	32
Troy.....	60,651	55
Utica.....	56,383	68
Yonkers.....	47,931	80

Not only the centers of population but the outlying portions of the country were benefited by the canal,⁷⁶ and reliable local

channels, its commercial relations became more extended, and its trade enlarged. Wholesale and commission houses were established, and its manufacturers increased the capacity of their mills, and secured larger orders for their productions." *History of the City of Troy*, by A. J. Weise, p. 165. (1876.)

*Cities not having canal communication.

†From Bulletin No. 20 of the Department of Commerce and Labor, entitled, *Statistics of Cities of over 25,000 Inhabitants, for 1902 and 1903*.

⁷⁶"It is difficult to enable the younger portion of our readers to go back beyond all the important events that have been crowded into the last quarter of a century, and realize to its full extent, the magnitude of the projection of the Erie Canal, how great was the triumph achieved in its construction, and how vast and diffusive were the local and general benefits that flowed from it. To enable them to judge of its local influences, the change for the better that followed its completion, upon the Holland Purchase, we must go back to the years pending its final consummation.

"Here at the western extremity of the state, upon the Holland Purchase especially, new settlers had for several years failed to create a sufficient demand for the surplus product that

historians do not neglect to dwell upon the subject devotedly in language such as the following: "Wayne county lands, even to the lake shore, appreciated in value; farmers were encouraged to new energy and to extend their planting and sowing; money became more plenty; . . . a new era of prosperity began. . . . Clyde, Lyons, Newark and Palmyra, with other points of shipment in the county, promptly felt the influence of the canal (while Newark may be said to owe its existence to the same influence).""

The development of rural and agricultural interests is more forcibly presented in another excerpt, this time from an Orleans county historian. "To no part of the State of New York has the Erie Canal proved of more benefit than to Orleans county," says this historian. "Although the soil was fertile and productive, and yielded abundant crops to reward the toil of the farmer, yet its inland location and great difficulty of transporting produce to market, rendered it of little value at home. Settlers who had located here, in many instances had become discouraged. Others, who desired to emigrate to the Genesee country, were kept back by the gloomy accounts they got of life in the wilderness, with little prospect of easy communication with the old Eastern States. . . . As soon as the Canal became navigable, Holley, Albion, Knowlesville and Medina, villages on its banks were built up. . . . The lumber of the country found a ready market and floated away. Wheat was worth four times as

began to be realized. The early settlers had passed through all the vicissitudes that have been enumerated in the progress of our narrative; the privations of their forest advents; the diseases of a new country, its chills and agues; the war and its scourges; the cold seasons and their attendants, frosts and stunted crops. They had subdued a rugged soil, and it had given good earnest of productiveness and plenty; but the difficulty of reaching a market had begun seriously to be felt; its consequences were a low range of prices for all they had to dispose of, stagnation of business, and the slow progress of improvement. It will be remembered that the son of a pioneer settler of Orleans county, relates that his father sold his wheat for twenty-five cents per bushel, in 1818; in 1823, it was sold in most of the village markets upon the Holland Purchase, as low as thirty-seven and a half cents. The bulk of the original debt to the Holland Company remained unpaid, and interest was adding to the principal. There were no remunerating prices for anything the settlers had to dispose of, save, perhaps, the lumber that was in near proximity to lake Ontario, and the articles of black salts and potash; the gloomy prospect before them was the holding on to their decaying log tenements, after they had hoped to supply their places with better ones, an increasing indebtedness for their lands and the liability of ultimate dispossession.

"Such was the general condition of the Holland Purchase in the years immediately preceding the completion of the Erie canal, up to those points, where it began to be reached by the surplus produce of this region."

Pioneer History of the Holland Purchase of Western New York, by O. Turner, pp. 617-618, (1850.) See also *Id.*, chapter on growth of towns along the canal.

"*Landmarks of Wayne County*, by Hon. Geo. W. Cowles, p. 70. (1895.)

much as the price for which it had been previously selling. Prosperity came in on every hand; the mud dried up, and the musketoos, and the ague, and the fever, and the bears left the country."⁷⁸

This is attributing a little more to the canal than is customary. It is not wholly facetious, however, when we reflect that in Buffalo in 1816, "a reward of \$5 was voted for every wolf killed in town,"⁷⁹ and that the canal has served to drain many acres of mosquito-ridden, fever-infested marshes and convert them into wholesome, fertile farm lands.

CONCLUSION.

We purpose now to turn away from the consideration of the subject which has occupied our attention throughout this chapter. It may be well to remark that there are some phases of the influence of the canal upon which we have not touched, or to which we have done but meagre justice. We have not delved into the specific instances of the rise of sudden and enduring prosperity through the effects of canal-building. We have not given a word to the political battles waged upon the issue of "Internal Improvements," both in state and nation, and to the impetus afforded that issue everywhere by the success of the Erie canal. We have scarcely hinted at the fact which statesmen and economists have continually averred during the last fifty years, namely, that, had the canal accomplished no direct benefits, its potential possibilities as a public carrier, managed in the interests of the public, have so conserved rates of shipment across the country as to render the waterway indispensable to the nation. We have not studied the "marked influence [it has exerted] on the cost of transportation over all the country extending from the interior of the Gulf States to the Saint Lawrence River, and from the great plains of the eastern foothills of the Rocky Mountains to

⁷⁸*Pioneer History of Orleans County*, by (Judge) Arad Thomas, pp. 55-56. (1871.)

⁷⁹Anderson and Flick's *Short History of the State of New York*, p. 152.

the Atlantic Ocean."⁸⁰ We have not considered that "the Erie Canal influences the rates of transportation from Chicago, St. Louis, Cincinnati, etc., to the interior of the Gulf States . . . until it reaches a line where low ocean rates from New York to the Gulf cities . . . exercise their influence upon the rates to the adjacent interior points."⁸¹ "The influence of the Erie Canal as a regulator of freight rates has been felt over the entire country,"⁸² and our only excuse for omitting a study so attractive is the impossibility of condensing it sufficiently and at the same time doing it justice. It belongs essentially, moreover, to the later period of canal history, through which we have not attempted to follow minutely the career of the great waterway.

Unquestionably we have failed to consider and to expand fittingly the study of numerous other influences resulting directly or indirectly from this peculiar institution, which is still in a large sense just as unique and, it would seem, appears to the mind of the people of the State of New York, just as vitally essential to their welfare as it was acknowledged to be fifty and seventy-five years ago. The strength of the popular sentiment in its favor through so many vicissitudes is an established fact, which cannot be ignored. In spite of periods of maladministration, through passing reverses of fortune and amid partisan war-cries, the heart of this great commonwealth has never swayed so far that a reminder of the magnificent services of our historic waterway would not suffice to touch a chord of loyalty. Criticise and argue as we may, the abiding devotion of an intelligent and sovereign people amid the vexations of nearly a century is a splendid tribute. It is, indeed, the surest commendation, the safest human testimonial to the success, utility and importance of the object of

⁸⁰Speech of Senator Windom, chairman of the Select Committee on Transportation Routes to the Seaboard, in 1878. See *House Report* 628, 48th Congress, 1st session.

⁸¹See *Id.* Quotations from letter of Albert Fink (written in 1878) whose *Report upon the Adjustment of Railroad Transportation Routes to the Seaboard* is now classic.

⁸²Quotation from Hon. G. P. Lawrence of Massachusetts. See *Congressional Record* for 1905, p. 3098.

A statistical study of this subject may be found in the *Report of the Committee on Canals of New York State*. (1899.)

their devotion—an argument whose eloquence we certainly cannot escape.

But the great waterway has well earned the praise and support of the people. This fact, too, is apparent—so apparent that he who runs may read. The world knows that the Erie canal has been a tremendous agency in ranging our State in the forefront of the forces of civilization; that it stimulated the development of the frontier and built up a great industrial zone from east to west and drew unnumbered cargoes to our port and made that port the commercial metropolis of the New World. Like a magnet it attracted to its own shores the mightiest of the transcontinental railroads. Like a weapon in our hands it held these railroads in check, when they had become strong and grasping. It extended our custom far and wide. It gave us the lead in the contest for the supremacy. It broadened us in the school of commercial intercourse. In fact, it made possible that imperial democracy—that Empire State—unique in the annals of the world.

But the Erie canal exerted no mean effect upon the nation. Its influence spread beyond and strove to efface our local boundaries and to make of the loose confederation of states and territories one united people. The opening of the canal marks the beginning and was largely the immediate cause of the epoch of emigration from the East and immigration into the West. It was also a signal for the sudden and portentous increase of alien immigration. Its "value to the States bordering on the Great Lakes . . . [in promoting their development was] incomputable."⁸³ It secured the great Northwest, which once hung in the balance, to eastern rather than to southern sympathies. It prevented trade from following down the St. Lawrence to an outlet in foreign territory. The canal became, indeed, the principal "Gateway to the Interior"—the great artery of inland travel—knitting together the thrifty East and the newly-developing West.

All this, which we see realized as we look around us, is a glorious eulogy on the genius and courage and beneficence of our

⁸³*Transportation on the Great Lakes of North America*, Geo. G. Tunell, *House Doc. No. 277*, Fifty-fifth Congress, second session, p. 30.

forefathers, who discerned, in advance of their age, the canal, on the one hand, and on the other—prosperous cities, the desert blossoming as the rose, the invigoration of industry, the spread of knowledge, and the dissemination of happiness and plenty.⁶⁴ The canal has indeed builded cities and peopled plains. But while the cities and the plains may pass away, the fruits of our education in the broad and humane school of commercial intercourse and the golden ties of kinship and union that it has knit about us will endure. When other memories fail, these forces will still keep alive countless reverberations of the influence of “Our Grand Canal.”

⁶⁴Such are the sentiments expressed in the memorial presented by the City of New York to the Legislature of 1816. See *Canal Laws*, Vol. I, p. 129. See also speech of De Witt Clinton to the Legislature, Jan. 27, 1818. *Assembly Journal*, 1818, p. 9.

NOTE: Since the preparation of this chapter, Secretary of State Elihu Root, at a dinner of the Pennsylvania Society in New York, has given fitting expression to the present tendency toward the principle of increasing the power of the General Government and away from the political doctrine of States' rights—the theory of government which has been styled “federalism or nationalism or centralized democracy.” This modern trend is the outgrowth of an influence chiefly inaugurated by the early improvements in waterways—what we have described as probably the most signal benefit the canal ever bestowed upon the nation—its office in binding together the several sections of our land. Mr. Root said, in part:

“We are urging forward in a development of business and social life which tends more and more to the obliteration of State lines and the decrease of State power; the relations of the business over which the Federal Government is assuming control of interstate transportation with State transportation, of interstate commerce with State commerce are so intimate, and the separation of the two is so impracticable that the tendency is plainly toward the practical control of the National Government over both. . . . Our whole life has swung away from the old State centers and is crystallizing about National centers; the farmer, the manufacturer, the merchant, now pursue their respective avocations with reference to the wants of far distant consumers where formerly their activities were devoted to the needs of their home communities. Vast throngs of our people move to and fro from State to State; old State lines are obliterated.” Report of speech in *New York Tribune*, Dec. 13, 1906.

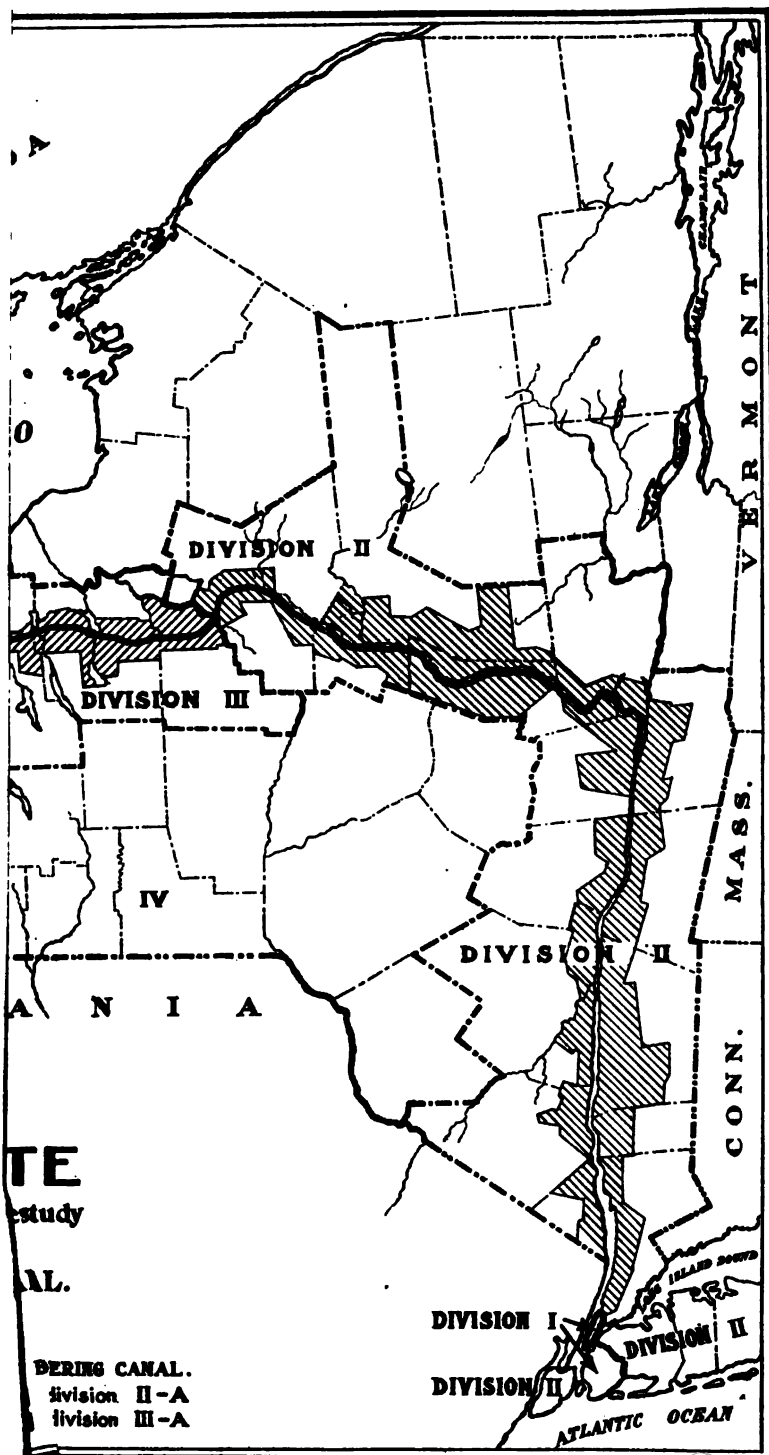


Plate No. I.

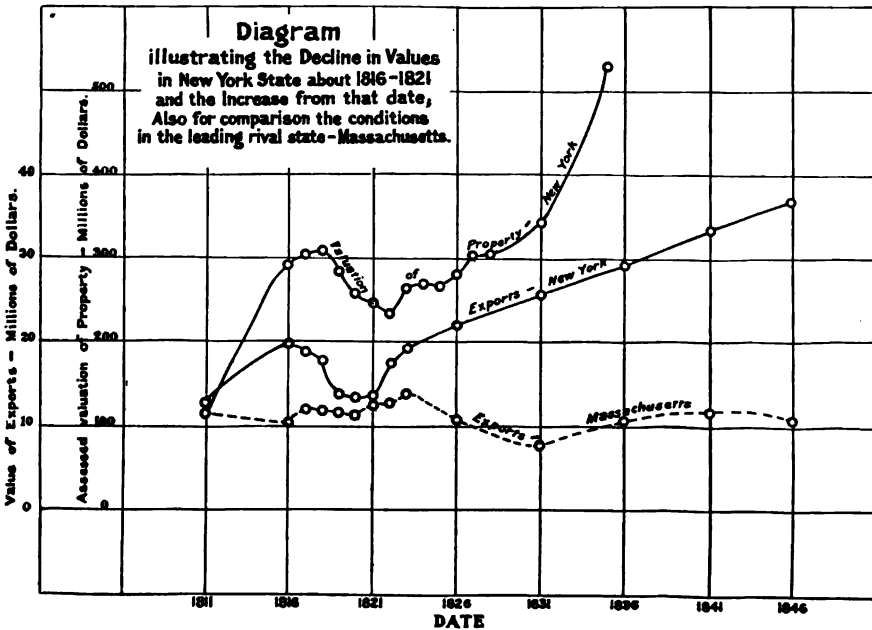
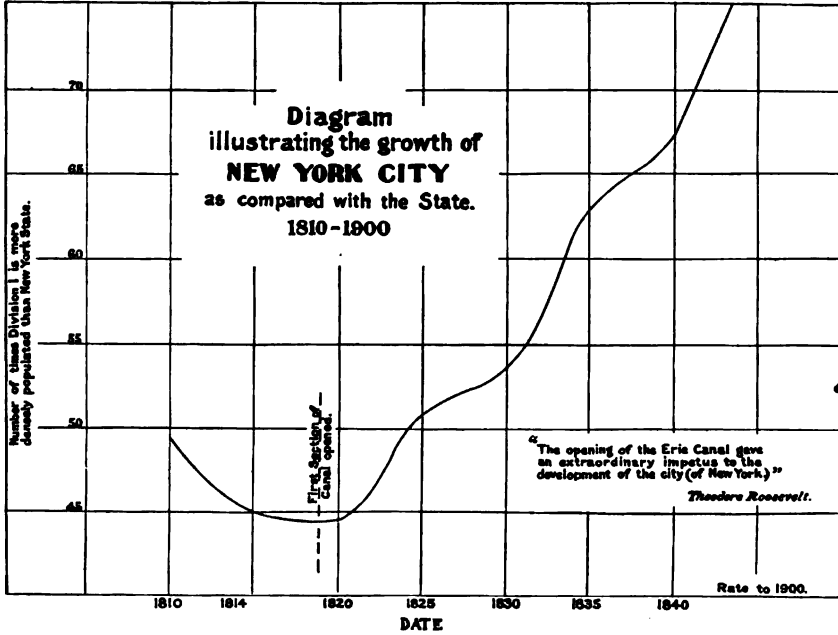
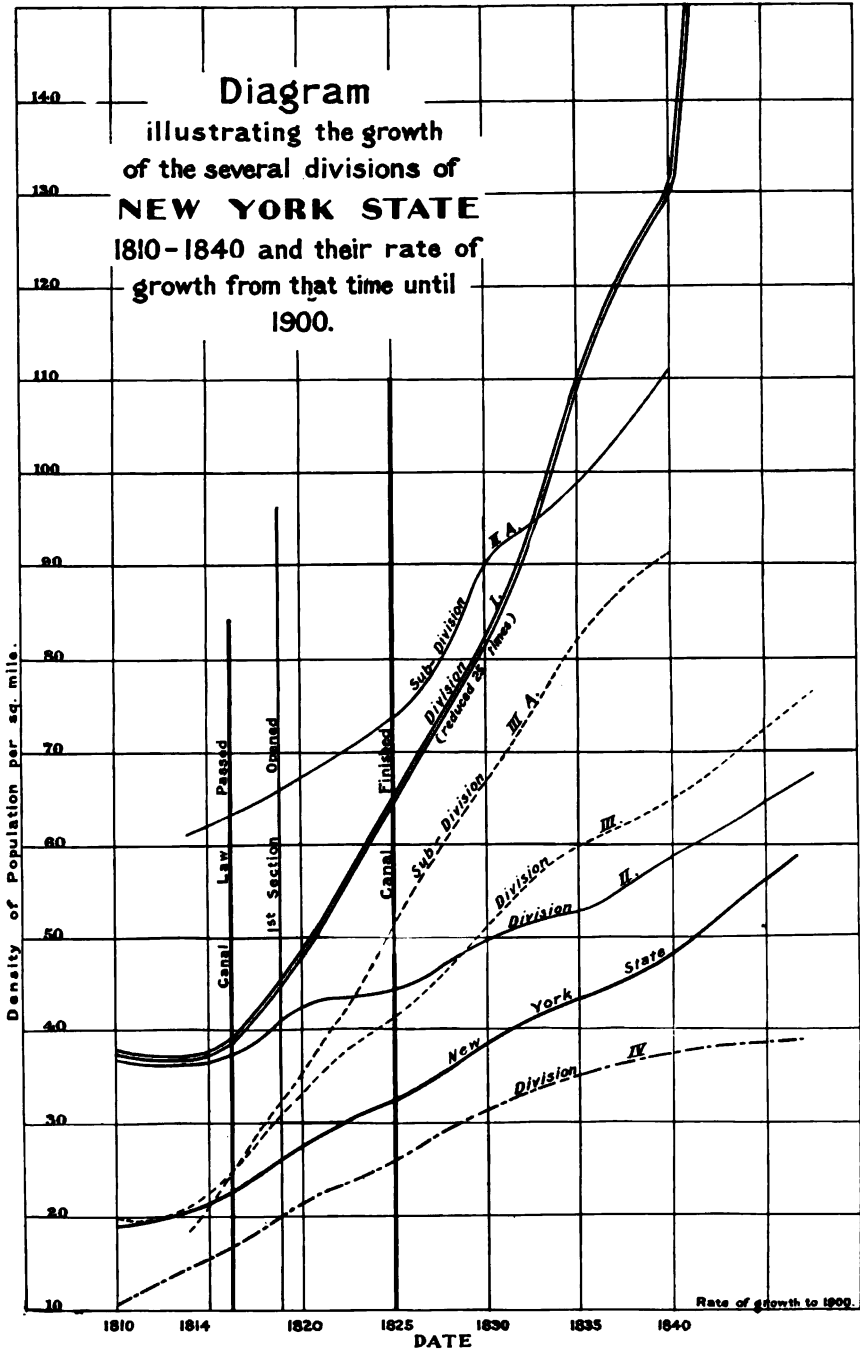


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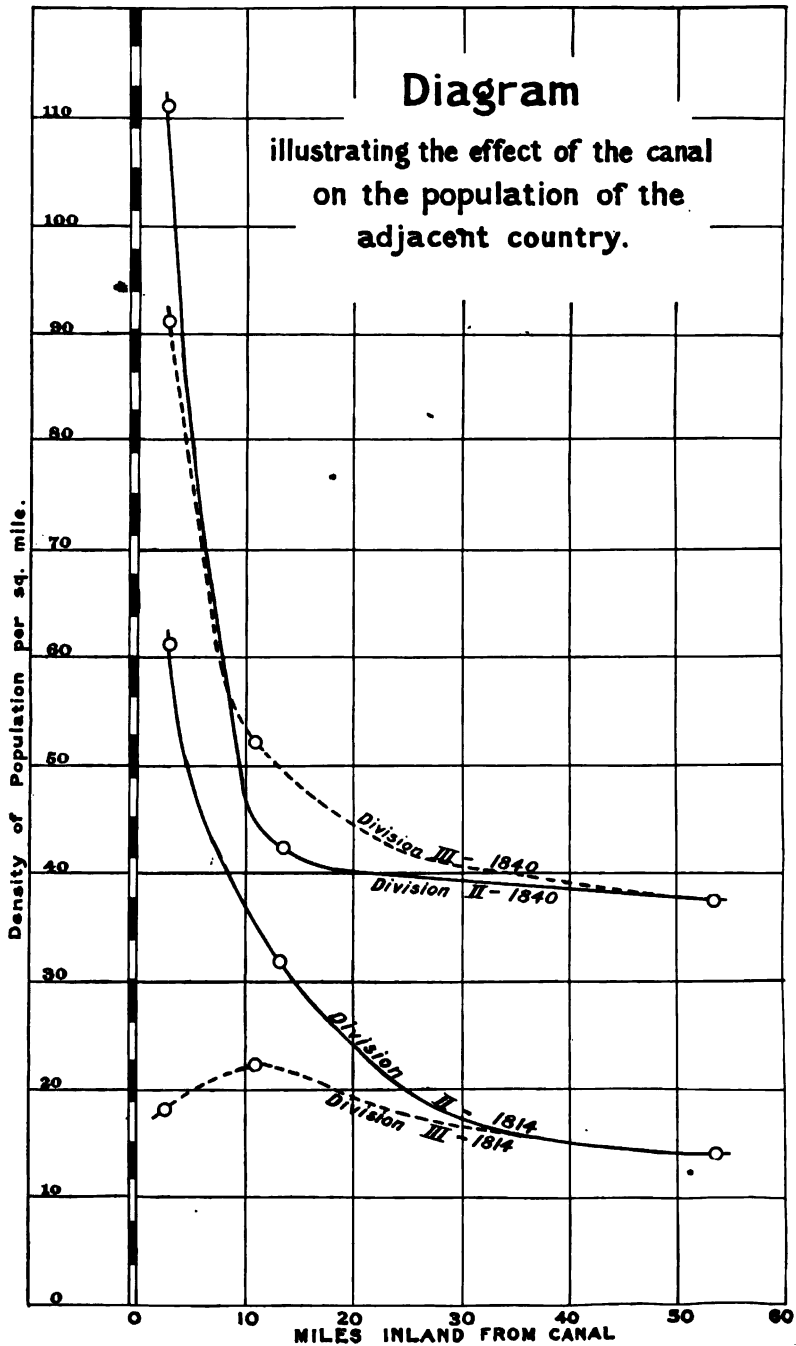


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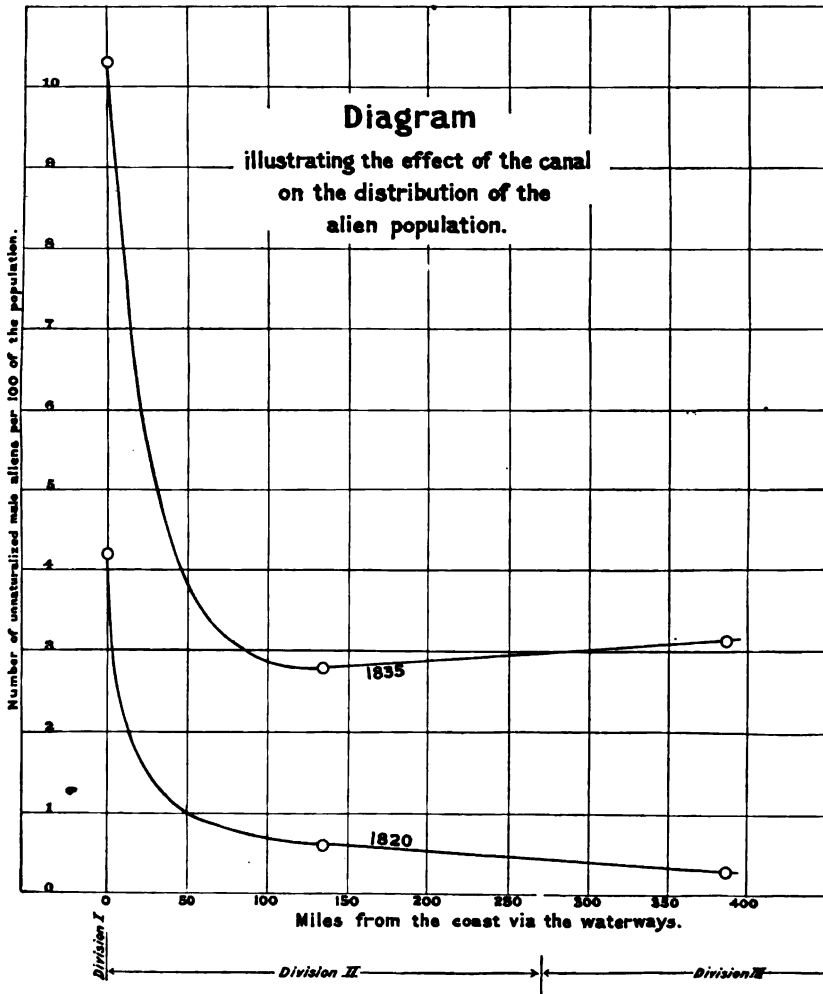
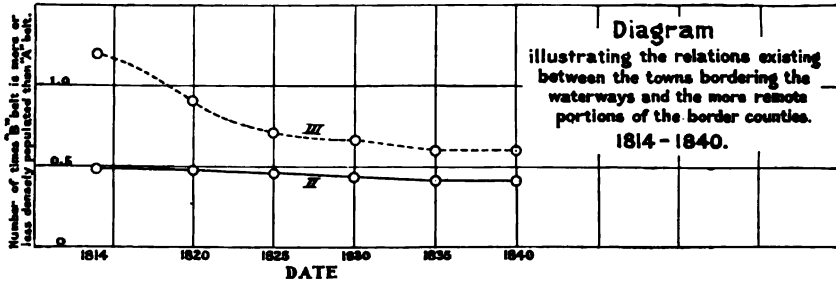
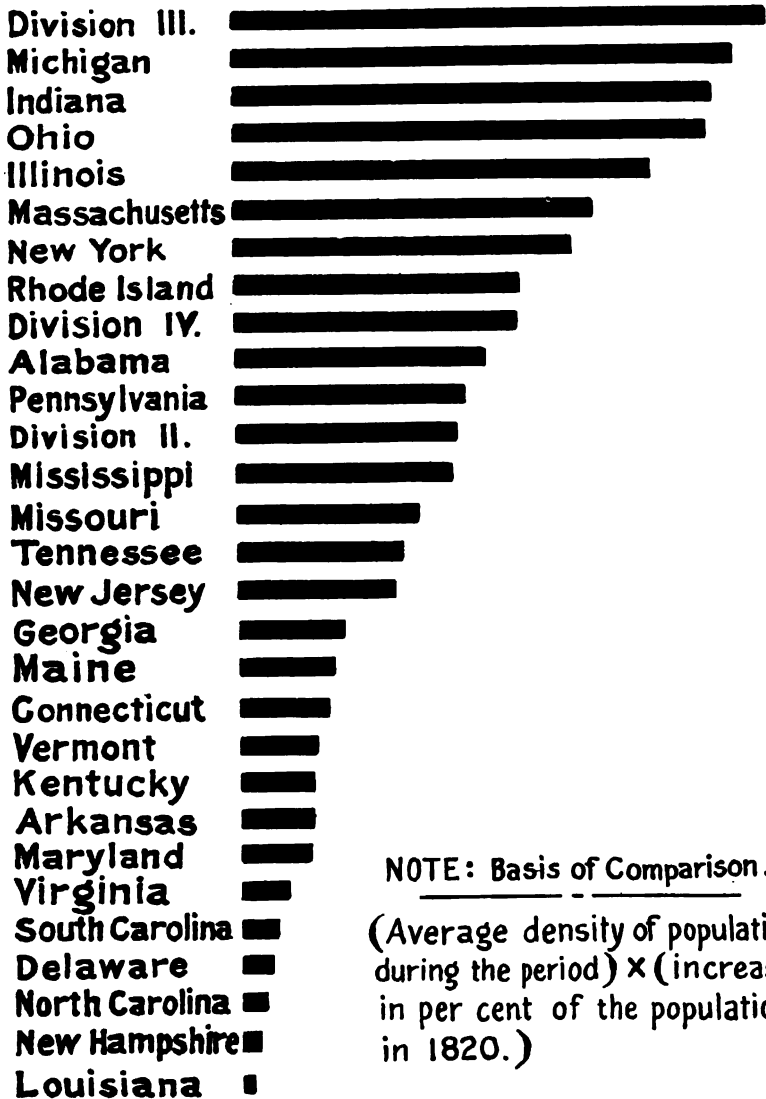


Plate N° V.

Relative Progress of the States of the Union and the several Divisions of N.Y. State. 1820 - 1840.



NOTE: Basis of Comparison.

(Average density of population
during the period) × (increase
in per cent of the population
in 1820.)

See Table N° 18.

TABLES APPENDED TO CHAPTER XXV.

TABLE NO. 1.

SHOWING RELATIVE RANK OF STATES OPENED BY THE ERIE CANAL COMPARED
WITH OTHER STATES OF THE U. S. ON BASIS OF POPULATION.

STATE.	1790.	1800.	1810.	1820.	1830.	1840.	1900.
New York.....	5	3	2	1	1	1	1
Ohio.....		17	13	5	4	3	4
Indiana.....		20	20	18	13-	10	8
Illinois.....			23	24	20	14	3
Michigan.....			24	27	27	23	9

Abstracted from Table XCIV, page 97, *Statistical View of the United States*, by the Supt. of the 7th Census. 1900 columns from 12th Census; States and Territories in 1840 = 30; in 1900 = 52.

TABLE NO. 2.

SHOWING EARLY GROWTH OF STATES BORDERING THE GREAT LAKES AND OPENED
BY THE ERIE CANAL.

STATE.	Date of admission to the Union.	PERCENTAGE OF DECENNIAL INCREASE.			
		1800-1810.	1810-1820.	1820-1830.	1830-1840.
Ohio.....	1802	409 (I)	152 (IV)	*	
Indiana.....	1816	403 (II)	500 (I)	133 (IV)	*
Illinois.....	1818		350 (II)	185 (II)	202 (III)
Michigan.....	1837			256 (I)	571 (I)

(I) = Largest percentage of increase among the states of the Union.

(II) = 2nd largest percentage of increase among the states of the Union, *et cetera*.

*End of Pioneer Period of most rapid development.

TABLE NO. 3.

SHOWING TONNAGE OF SHIPMENTS PASSING ON THE ERIE CANAL, ENTERING
BUFFALO FROM AND LEAVING FOR OTHER STATES. *

STATE.	No. tons coming to tide-water. 1835.	No. tons leaving tide-water. 1835.	Total.
Ohio.....	23,267.7	8,976.5	32,244.2
Michigan.....	588.6	7,225.9	7,814.5
Pennsylvania.....	15.6	760.5	776.1
Illinois.....	95.4	2,132.9	2,228.3
Canada.....	17.0	104.2	121.2
Virginia.....		1.4	1.4
Missouri.....		29.4	29.4
Alabama.....		29.9	29.9
Tennessee.....		166.9	166.9
Indiana.....		1,695.7	1,695.7
Kentucky.....		488.2	488.2
Total.....	23,984.3	21,611.5	45,595.8

*See Assembly Document, No. 65, 1836.

TABLE NO. 4.

STATEMENT OF TONS OF PROPERTY
ARRIVING AT TIDE-WATER, VIA THE
ERIE CANAL.*

YEAR.	From Western states.	From New York State.
1836.....	54,219	364,906
1837.....	56,255	331,251
1838.....	83,233	336,016
1839.....	121,761	264,596
1840.....	158,148	309,167
1841.....	224,176	308,344
1842.....	221,477	258,622
1843.....	256,376	378,969
1844.....	308,025	491,791
1845.....	304,551	635,039
1846.....	506,830	600,440
1847.....	812,840	618,412
1848.....	650,154	534,183
1849.....	768,659	498,065
1850.....	841,501	530,358
1851.....	1,045,820	462,857
1852.....	1,151,978	492,726
1853.....	1,213,660	637,748
1854.....	1,094,391	602,167
1855.....	1,092,876	327,839
1856.....	1,212,550	374,580
1857.....	1,019,998	197,201
1858.....	1,273,099	223,588
1859.....	1,036,634	414,699
1860.....	1,896,975	379,086
1861.....	2,158,425	291,184
1862.....	2,594,837	322,257
1863.....	2,279,252	368,437
1864.....	1,907,136	239,498
1865.....	1,904,156	174,205
1866.....	2,235,716	287,948
1867.....	2,129,405	96,707
1868.....	2,215,222	163,350
1869.....	2,028,568	229,121
1870.....	2,048,947	241,751

*Assembly Document No. 31, Table No. 28,
1877.

TABLE NO. 5.

SHOWING GROWTH OF CLEVELAND.

DATE.	Popu- lation.	Increase.	Per- centage- increase.
1820.....	606		
1830.....	1,076	470	77.5
1840.....	6,071	4,995	464.2
1850.....	17,034	10,963	180.6

TABLE NO. 6.

SHOWING GROWTH OF DETROIT.

DATE.	Popu- lation.	Increase.	Per- centage- increase.
1810.....	770		
1820.....	1,442	672	73.3
1830.....	2,222	780	54.1
1840.....	9,192	6,970	313.7
1850.....	21,019	11,827	128.7

TABLE NO. 7.

SHOWING GROWTH OF SEVEN LEADING
SEABOARD STATES.

Popu- lation in—	I 1820.	II 1840.	(II) + (I)
Massachu'tts.....	523,287	737,699	1.4
New York.....	1,372,812	2,428,921	1.8
New Jersey.....	277,575	373,306	1.3
Penn'sylvania.....	1,049,458	1,724,033	1.6
Maryland.....	407,350	469,232	1.2
Virginia.....	1,065,366	1,239,797	1.2
S. Carolina.....	502,741	594,398	1.2

TABLE NO. 8.*

SHOWING PERCENTAGE OF THE TOTAL POPULATION OF THE UNITED STATES
CONTAINED IN EACH OF THE THIRTEEN ORIGINAL STATES IN THE SEVERAL
CENSUS YEARS.

STATE.	1790.	1800.	1810.	1820.	1830.	1840.	1850.
New Hampshire.....	3.61	3.46	2.96	2.53	2.09	1.67	1.37
Massachusetts.....	9.64	7.98	6.52	5.43	4.75	4.32	4.29
Rhode Island.....	1.76	1.3	1.07	0.86	0.76	0.64	0.64
Connecticut.....	6.06	4.73	3.62	2.86	2.31	1.82	1.6
New York.....	8.65	11.05	13.25	14.24	14.91	14.23	13.36
New Jersey.....	4.69	4.00	3.39	2.88	2.49	2.19	2.11
Pennsylvania.....	11.05	11.35	11.19	10.89	10.48	10.1	9.97
Delaware.....	1.5	1.21	1.0	0.75	0.6	0.46	0.39
Maryland.....	8.14	6.44	5.28	4.23	3.48	2.75	2.51
Virginia.....	19.04	16.59	13.46	11.05	9.42	7.26	6.13
North Carolina.....	10.02	9.01	7.67	6.63	5.74	4.41	3.75
South Carolina.....	6.34	6.51	5.73	5.22	4.52	3.48	2.88
Georgia.....	2.1	3.06	3.49	3.54	4.02	4.06	3.91

*Abstracted from *Statistical View of the United States*, 1854, Table XCV, page 97.

TABLE NO. 9.

SHOWING COMPARATIVE GROWTH OF PRINCIPAL AMERICAN CITIES.

Population in	I. 1800.	II. 1820.	(II) + (I)	IV. 1840.	(IV) + (II)
Boston.....	24,937	43,298	1.7	93,383	2.2
New York and Brooklyn.....	62,867	130,881	2.1	348,943	2.7
Philadelphia City.....	41,220	63,802	1.5	93,665	1.5
Philadelphia County (.....	81,009	137,097	1.7	258,037	1.9
(= present city)).....					
Baltimore.....	26,514	62,738	2.4	102,313	1.6

TABLE NO. 10.

TONNAGE OF THE NEW YORK CENTRAL
AND ERIE RAILROADS AND THE CANALS,
1853-1885.*

Year.	N. Y. C. R. R.	Erie R. R.	Canals.
1853.....	360,000	631,039	4,247,853
1854.....	549,804	743,250	4,165,862
1855.....	670,073	842,048	4,022,617
1856.....	776,112	943,215	4,116,084
1857.....	838,791	978,066	3,344,061
1858.....	765,407	816,954	3,665,192
1859.....	834,319	869,073	3,781,684
1860.....	1,028,183	1,139,554	4,650,214
1861.....	1,167,302	1,253,418	4,507,635
1862.....	1,387,433	1,632,955	5,598,785
1863.....	1,449,604	1,815,096	5,557,692
1864.....	1,557,148	2,170,798	4,852,941
1865.....	1,275,299	2,234,350	4,729,654
1866.....	1,602,197	3,242,792	5,775,220
1867.....	1,667,926	3,484,546	5,688,325
1868.....	1,846,599	3,908,243	6,442,225
1869.....	2,281,885	4,312,209	5,859,080
1870.....	4,122,000	4,852,505	6,173,769
1871.....	4,532,956	4,844,208	6,467,888
1872.....	4,393,965	5,564,274	6,673,370
1873.....	5,522,724	6,312,702	6,364,782
1874.....	6,114,678	6,364,276	5,804,588
1875.....	6,001,954	6,239,946	4,859,858
1876.....	6,803,680	5,972,818	4,172,129
1877.....	6,351,356	6,182,451	4,955,963
1878.....	7,695,413	6,150,568	5,171,320
1879.....	9,015,753	8,212,641	5,362,372
1880.....	10,533,038	8,715,892	6,457,556
1881.....	11,591,379	11,086,823	5,179,192
1882.....	11,330,393	11,895,238	5,467,423
1883.....	10,892,440	13,610,623	5,684,956
1884.....	10,212,418	11,071,938	5,009,488
1885.....	10,733,499	10,253,489	4,731,784

TABLE NO. 11.

RISE AND FALL OF
THE AMERICAN MERCHANT MARINE.†

Year.	Foreign shipping per capita.
1790.....	<i>Cubic Feet.</i> 9.75
1792.....	10.55
1794.....	10.32
1796.....	12.53
1798.....	12.06
1800.....	12.33
1802.....	9.74
1804.....	10.82
1806.....	12.28
1808.....	11.09
1810.....	13.43
1812.....	9.78
1814.....	8.17
1816.....	9.12
1818.....	6.30
1820.....	5.95
1822.....	5.63
1824.....	5.79
1826.....	6.00
1828.....	6.18
1830.....	4.15
1832.....	4.48
1834.....	5.18
1836.....	4.95
1838.....	4.39
1840.....	4.48
1850.....	6.23
1860.....	7.58
1870.....	3.76
1880.....	2.62
1890.....	1.47
1895.....	1.18
1898.....	0.99

*Report of Superintendent of Public Works.—1904, page 297.

†From *Philadelphia as a Seaport and Manufacturing City*. Publication, Philadelphia Commercial Museum.—1899.

TABLE NO. 12.*

SHOWING VALUE IN DOLLARS OF THE EXPORTS FROM TWO LEADING COMPETITIVE STATES.

	1811.	1816.	1821.	1826.	1831.	1836.	1841.	1900.†
New York...	\$12,206,215	\$19,600,031	\$13,162,917	\$21,947,791	\$25,535,144	\$28,920,436	\$33,139,833	\$518,834,471
Massachusetts...	11,235,465	10,120,439	12,484,091	10,068,862	7,733,763	10,384,346	11,437,343	112,195,555

*Data from *Statistical View of the United States*, Table CCVIII, page 187.

†These two were the principal commercial states until Louisiana passed Massachusetts about 1825 to 1830 in export trade.

‡1900 figures are for Customs Districts of New York and Boston only.

TABLE NO. 13.

SHOWING THE TONNAGE OF THE IMPORTS OF NEW YORK STATE FROM 1821-1853.

Year.	Imports.	Year.	Imports.
1821.....	23,629,246	1838.....	68,453,206
1822.....	35,445,628	1839.....	99,882,438
1823.....	29,421,349	1840.....	60,440,750
1824.....	36,113,723	1841.....	75,713,426
1825.....	49,639,174	1842.....	55,875,609
1826.....	38,115,630	1843.....	31,356,540
1827.....	38,719,644	1844.....	65,079,510
1828.....	41,927,792	1845.....	70,909,085
1829.....	34,743,307	1846.....	74,254,283
1830.....	35,624,070	1847.....	84,167,352
1831.....	57,077,417	1848.....	94,525,141
1832.....	53,214,402	1849.....	92,567,369
1833.....	55,918,449	1850.....	111,123,524
1834.....	73,188,594	1851.....	141,546,538
1835.....	88,191,305	1852.....	132,329,306
1836.....	118,253,416	1853.....	178,270,999
1837.....	79,301,722		

From *Statistical View of the United States*. Table CCVIII, page 186.

TABLE NO. 14

VALUE OF EXPORTS AND PROPERTY VALUATION

Date.	Exports.*	Real property.†	Personal property.†	Total.†
1816.....	\$19,600,031	\$250,182,474	\$40,680,034	\$290,862,508
1817.....	18,707,433	265,710,214	38,457,247	304,167,461
1818.....	17,872,261	271,721,102	37,611,638	309,332,740
1819.....	13,587,378	243,942,231	37,054,513	280,996,740
1820.....	13,163,244	222,148,986	33,403,379	255,552,365
1821.....	13,162,917	207,446,531	33,199,982	240,646,513
1822.....	17,100,482	198,439,210	32,864,290	231,303,500
1823.....	19,038,990	215,238,913	46,903,723	262,142,636
1824.....	22,897,134	211,577,310	57,908,315	269,485,625
1825.....	35,259,261	199,533,471	63,893,875	263,427,346
1900.....	518,834,471	.....	.....	5,686,921,678

*From *Statistical View of the United States*. †From Assembly Document, No. 66, 1834.

TABLE NO. 15.

COMPARISON OF EXPORTS AND IMPORTS OF NEW YORK STATE AND THE TRAFFIC ON THE STATE CANALS.

YEAR.	VALUE IN DOLLARS OF		
	Exports.	Imports.	Movement of articles on canals.*
1841.....	\$33,139,833	\$75,713,426	\$92,202,929
1851.....	86,007,019	141,546,538	159,981,801

*See report of Superintendent of Public Works, 1905, page 408. Data for canals previous to 1837 not available.

TABLE NO. 16.*

COMPARATIVE ORIGIN OF POPULATION IN THE STATE OF NEW YORK—BASED ON CENSUS OF 1855.

BORN IN	Percentages of the total population.
New York.....	64.077
New England.....	6.014
New Jersey and Pennsylvania.....	2.071
Southern states.....	0.378
Western states.....	0.340
United States.....	72.903
Foreign countries.....	26.585
At sea and unknown.....	0.512

*From Report of Paper by F. B. Hough, Sup't. of the State Census of 1855, read before the American Geographical and Statistical Society.

TABLE NO. 17.

VALUE OF EXPORTS FROM NEW YORK, MASSACHUSETTS, PENNSYLVANIA, MARYLAND AND LOUISIANA FOR 1821, 1841, 1846 AND 1850.

STATE.	1821.		1841.		1846.		1850.	
	Value.	Per cent.	Value.	Per cent.	Value.	Per cent.	Value.	Per cent.
New York*.....	\$13,162,917	33.6	\$33,139,833	37.2	\$36,935,413	41.0	\$52,712,789	46.7
Massachusetts.....	12,484,691	31.9	11,487,343	12.9	10,313,118	11.4	10,681,763	9.5
Pennsylvania.....	7,391,767	18.9	5,152,501	5.8	4,751,005	5.3	4,501,606	4.0
Maryland.....	3,850,394	9.8	4,947,166	5.5	6,869,055	7.6	6,967,353	6.2
Louisiana.....	2,222,172	5.8	34,387,483	38.6	31,275,704	34.7	38,105,350	33.7
Total.....	\$39,161,941		\$89,114,326		\$90,144,295		\$112,968,861	
Value of articles arriving, by way of the canals, at tide-water†.....			\$27,225,322	30.6	\$51,105,256	56.7	\$55,474,037	49.1

*Statistical View of the United States, page 187.

†Report of Superintendent of Public Works, on canals, 1904, page 308.

TABLE NO. 18.
POPULATION OF CITIES BORDERING THE CANAL.

Date.	Albany.	Watervliet.	Troy.	Schenectady.	Little Falls.	Utica.	Rome.	Syracuse.*	Rochester.	Lockport.	Tonawanda.	Buffalo.
1814...	10,023	2,564	4,841	7,134	.....	.....	3,069	1,241	.....	.....	.....	1,060
1820..	12,636	2,806	5,264	3,939	.....	2,972	3,569	1,814	1,502	.....	.....	2,095
1825...	15,971	3,574	7,859	4,608	.....	5,040	3,531	3,833	5,273	3,007	.....	5,141
1830...	24,209	4,965	11,556	4,268	2,539	8,323	4,366	6,929	9,207	3,823	.....	8,668
1835...	28,109	6,961	16,959	6,272	3,147	10,183	4,505	7,793	14,404	6,092	.....	19,715
1840...	33,721	10,141	19,334	6,784	3,881	12,782	5,680	11,013	20,191	9,125	1,261	18,213
1850...	50,763	12,446	28,785	8,921	4,855	17,565	7,918	22,271	36,403	12,323	2,072	42,261
1900...	94,151	14,321	60,651	31,682	10,381	56,383	15,343	108,374	162,608	16,581	7,421	52,387

*Included in Salina until 1843.

TABLE NO. 19.

SHOWING RELATIVE PROGRESS OF THE STATES OF THE UNION AND THE SEVERAL DIVISIONS OF NEW YORK STATE, 1820-1840, ON THE BASIS OF AVERAGE DENSITY TIMES PERCENTAGE-INCREASE. (ILLUSTRATED GRAPHICALLY ON PLATE NO. V.)

State.	Popu- lation 1820.*	Popu- lation 1840.*	Per cent gain.	Density 1820.	Density 1840.	Average density.	Area† sq. ml.	Average density X percentage- gain.
Alabama.....	144,317	580,756	309.3	2.7	11.2	6.95	52,990	2,149.64
Arkansas.....	14,273	97,574	583.6	0.3	1.8	1.05	54,635	54,635
District of Columbia.....	33,039	43,712	32.3	472.0	624.5	548.25	70	17,708.48
Connecticut.....	275,202	309,978	12.6	55.2	62.1	58.65	4,990	738.99
Delaware.....	72,749	78,085	7.3	35.5	38.1	38.8	2,050	268.64
Georgia.....	340,987	691,392	102.7	5.7	11.6	8.65	59,475	888.35
Illinois.....	155,211	476,183	762.5	1.0	8.5	4.75	56,000	3,621.87
Indiana.....	147,178	685,866	366.0	4.0	18.8	11.4	36,790	4,172.40
Kentucky.....	564,317	779,828	38.2	13.9	19.3	16.6	40,400	634.12
Louisiana.....	153,407	352,411	129.7	0.3	0.8	0.55	448,720	71.34
Maine.....	298,335	501,793	68.2	9.0	15.2	12.1	33,040	825.22
Maryland.....	407,350	470,019	15.4	33.4	38.5	35.95	12,210	533.63
Massachusetts.....	523,287	737,699	40.9	62.9	88.7	75.8	8,315	3,100.22
Michigan.....	8,896	1,724,033	2,286.2	0.2	3.6	1.90	58,900	4,343.78
Mississippi.....	75,448	375,651	397.9	1.5	7.7	4.65	48,610	1,850.24
Missouri.....	66,586	383,702	476.3	1.0	5.5	3.25	69,415	1,592.48
New Hampshire.....	244,161	284,574	16.6	26.2	20.5	28.35	9,336	1,701.61
New Jersey.....	277,575	373,306	34.5	33.8	45.4	39.60	8,224	1,366.07
New York.....	638,829	753,419	17.9	12.2	14.4	13.30	52,286	238.07
North Carolina.....	581,434	1,519,467	161.3	14.2	37.0	25.60	41,060	4,129.28
Ohio.....	1,049,458	1,724,033	64.2	22.8	37.5	30.15	46,000	1,935.63
Pennsylvania.....	83,059	108,830	31.0	66.4	87.1	79.95	1,250	2,478.45
Rhode Island.....	502,741	594,398	18.2	15.5	17.8	16.55	33,393	303.03
South Carolina.....	422,813	829,210	96.1	10.1	19.7	14.80	42,050	1,431.89
Tennessee.....	235,764	291,948	23.8	24.7	30.5	27.60	9,565	656.88
Vermont.....	1,065,379	1,239,797	16.4	25.1	29.2	27.60	42,450	445.20
Virginia.....	1,372,812	2,428,921	76.9	25.1	48.3	37.80	50,203	2,905.82
New York, Division III.....	256,047	500,290	95.4	33.1	64.7	48.90	7,737	4,665.06
New York, Division IV.....	300,685	531,104	76.6	21.3	37.6	29.45	14,134	2,456.87
New York, Division I.....	134,893	360,323	167.2	121.5	324.6	223.05	1,111	37,293.56
New York, Division II.....	531,742	733,347	37.9	42.6	58.7	50.65	12,496	1,919.54

*Population figures from *Statistical View of the U. S.*, by J. D. De Bois, 1854.
†Area includes land and water, taken from the *Encyclopedia Americana*.

TABLE NO. 20.
STUDY OF THE POPULATION OF THESE COUNTIES OF DIVISION IV WHICH CONTAINED LATERAL CANALS.

Counties.	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1845.
Sullivan.....	6,108	6,233	8,900	10,373	12,372	13,755	15,029	18,727
Delaware.....	20,203	19,239	26,587	29,545	32,933	34,192	35,396	36,960
Schoharie.....	18,945	19,323	23,154	25,920	27,904	28,508	32,358	32,488
Otsego.....	38,802	40,587	44,856	47,898	51,372	50,428	49,028	50,509
Cortland.....	8,869	10,963	16,507	20,271	23,963	24,168	24,907	25,081
Genesee and Wyoming.....	12,588	17,100	38,158	40,906	51,992	58,588	59,587	56,066
Total (A).....	105,515	113,475	158,162	174,939	200,266	209,639	217,205	219,845
Division IV, from Table No. 21—B.....	152,894	201,550	300,685	369,032	443,160	496,121	531,104	545,768
Total (B).....	47,379	88,075	142,523	194,093	242,894	285,482	313,899	325,923
Density per square mile.....	5.79	10.9	17.5	23.7	29.8	34.9	38.4	39.9

A = Counties having no laterals
B = Counties containing laterals } Division IV.

TABLE NO. 21—A.
POPULATION OF DIVISIONS I AND II.

COUNTY.	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1900.	Area in square miles.
<i>Division I.*</i>									
Kings.....	8,303	7,655	11,187	14,679	20,537	32,057	47,613	1,166,582	72
New York.....	96,373	95,519	123,706	166,086	207,021	270,089	312,710	2,050,600	39
Total population.....	104,676	103,174	134,893	180,765	227,558	302,146	360,323	3,217,182	111
Periodic gain in population...	-1,502	31,719	45,872	46,793	74,588	58,177		238,071	
<i>Division II.†</i>									
Suffolk.....	21,113	21,368	24,272	23,695	26,780	28,274	32,469	77,582	1,200
Queens.....	19,336	19,269	21,519	20,331	22,275	25,130	30,324	6208,447	688
Richmond.....	5,347	5,502	6,135	5,932	7,084	7,691	10,965	67,021	59
Westchester.....	30,272	26,367	32,638	33,131	36,456	38,790	48,686	2184,257	208
Rockland.....	7,758	7,817	8,837	8,016	9,388	9,696	11,975	38,298	208
Putnam.....	9,353	9,353	11,268	11,865	12,701	11,551	12,825	13,787	234
Orange.....	34,347	31,284	41,213	41,732	45,372	45,096	50,739	103,859	838
Dutchess.....	51,363	43,707	46,615	46,698	50,926	50,704	52,398	81,670	810
Ulster.....	26,576	26,328	30,834	32,015	36,559	39,960	45,822	88,422	1,204
Columbia.....	32,390	33,979	38,330	37,970	39,970	40,746	43,252	43,211	688
Greene.....	19,536	20,200	22,996	26,229	29,525	30,173	30,446	31,478	686
Rensselaer.....	36,309	36,833	40,153	44,065	49,472	55,515	60,259	121,697	690
Albany.....	34,661	33,885	38,116	42,821	53,537	59,762	68,593	165,571	514
Saratoga.....	33,147	31,139	36,052	36,295	38,616	38,012	40,553	61,089	862
Schenectady.....	10,201	10,896	13,081	12,876	12,334	16,230	17,387	46,852	221
Montgomery.....	41,214	40,074	37,569	39,708	43,594	48,359	35,818	47,488	214
Fulton.....	22,046	20,837	31,017	33,040	35,869	36,501	18,049	42,842	544
Herkimer.....	33,792	40,235	50,997	57,847	71,336	77,518	37,477	51,049	1,745
Oneida.....	459,408	459,071	531,742	554,264	621,784	659,408	733,347	132,800	1,215
Total population.....	459,408	459,071	531,742	554,264	621,784	659,408	733,347	1,607,320	12,496
Periodic gain in population...	-337	72,671	22,522	67,520	37,624	73,939		672,831	

*Containing 0.22 per cent of the area of the state. †Containing 24.9 per cent of the area of the state.
a Part of Westchester annexed to New York in period 1890-1900. b Nassau, organized from part of Queens in 1890, is here included with Queens.
c These figures show the average quinquennial increase between 1840 and 1900.

TABLE NO. 21—B.
POPULATION OF DIVISIONS III AND IV, AND NEW YORK STATE.

COUNTY.	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1900.	Area in square miles from 1875 census.
<i>Division III.*</i>									
Madison.....	25,144	26,376	32,208	35,646	39,037	41,741	40,008	40,545	670
Onondaga.....	25,687	26,091	41,467	48,432	58,974	60,508	67,911	164,726	812
Cayuga.....	29,863	29,850	38,897	42,743	47,847	49,202	50,338	68,234	786
Seneca.....	16,609	16,045	23,619	20,169	21,031	22,927	24,874	28,114	420
Wayne.....	.....	.....	.....	26,761	33,656	37,786	42,057	48,660	624
Ontario.....	42,032	44,467	64,993	37,422	40,170	40,870	43,801	49,605	640
Monroe.....	.....	69,346	36,108	39,108	49,920	58,083	64,902	217,634	682
Orleans.....	.....	7,324	12,819	14,460	18,773	22,863	25,127	30,164	405
Niagara.....	8,971	7,477	22,990	13,262	16,509	26,490	31,132	74,961	558
Erie.....	.....	.....	.....	24,316	35,710	57,594	62,465	453,666	1,071
Chautauqua.....	2,381	4,259	12,568	20,639	34,087	44,866	47,975	58,314	1,099
Total population.....	150,967	162,038	256,047	322,958	396,313	463,067	500,290	1,246,872	7,737
Periodic gain in population.....	11,071	94,009	66,911	73,355	66,754	37,223	.....	602,215	.....
<i>Division IV.†</i>									
Sullivan.....	6,108	6,233	8,900	10,373	12,372	13,755	15,629	32,306	1,062
Delaware.....	20,203	19,239	26,587	29,565	32,933	34,192	36,396	46,413	1,580
Broome.....	8,130	68,482	14,343	13,893	17,592	20,190	22,339	69,149	706
Tioga.....	7,899	10,438	16,971	19,951	27,706	33,999	20,527	27,951	543
Chemung.....	.....	.....	.....	.....	.....	.....	.....	54,063	406
Steuben.....	7,246	11,121	21,989	25,004	33,875	41,435	46,139	52,822	1,425
Allegany.....	1,942	3,634	9,330	18,164	26,218	35,214	40,975	41,501	1,033
Cattaraugus.....	4,058	67,600	4,090	8,643	16,726	24,986	28,872	65,943	1,334
Schoharie.....	18,945	19,323	23,154	25,926	27,904	28,508	32,358	26,854	675
Otsego.....	38,802	40,567	44,856	47,898	51,372	50,428	49,628	48,939	1,038
Chenango.....	24,221	34,215	31,215	34,215	37,404	40,762	40,785	36,568	1,898
Cortland.....	16,507	24,221	20,271	20,271	23,093	24,168	24,607	27,576	485
Tompkins.....	8,869	10,963	20,681	32,908	36,645	38,008	37,948	33,830	506
Schuyler.....	.....	15,844	.....	.....	.....	.....	.....	15,811	352

<i>Yates</i>	5,764	11,025	17,455	19,019	19,796	20,444	20,318	320
<i>Livingston</i>	48,871	413,879	23,860	27,719	31,092	35,140	37,059	655
<i>Wyoming</i>.....	.....	.....	.....	.....	.....	.....	30,413	690
<i>Genesee</i>	12,588	38,168	40,906	51,992	58,588	59,587	34,561	507
Total population.....	152,894	300,685	369,032	443,160	495,121	531,104	731,677	14,134
Periodic gain in population..	48,656	99,135	68,347	74,128	21,961	35,983	e16,714	

New York State.

Population.....	959,049	a1,026,612	1,372,812	1,616,458	1,923,522	2,174,517	2,428,921	50,203
Periodic gain in population ..	67,563	346,200	243,646	307,064	250,995	254,404	e453,331	

*Containing 15.4 per cent of the area of the state.

†Containing 28.2 per cent of the area of the state.

NOTE:—Figures in these tables not copied directly from the census, but estimated, or compiled to allow for changes in geographical boundaries, etc., are printed in italics.

NOTE:—The Township data for the 1810 census not being available, no allowance has been made for changes in county boundaries; therefore the figures shown are not wholly reliable for that year.

a Returns slightly deficient.

b Cattaraugus county omitted in Census of 1814 and estimated here.

c Towns taken from Genesee county only.

d Towns taken from Ontario county only.

e These figures show the average quinquennial increase between 1840 and 1900.

TABLE NO. 22.
STATISTICS OF PROPERTY VALUATION, ALIENS AND IMPROVED LAND FOR DIVISIONS I, II AND III, AND NEW YORK STATE.

COUNTY.	ASSESSED VALUATION OF PROPERTY.				NUMBER OF UNWAT- ERIALIZED MALE ALIENS.		IMPROVED LAND IN ACRES	
	REAL.		PERSONAL.		1820.	1835.	1821.	1835.
	1820.	1835.	1820.	1835.				
Division I.								
Kings.....	\$2,697,736	\$28,020,644	\$948,337	\$3,920,288	308	3,414	22,530	22,535
New York.....	52,084,328	143,732,425	17,446,425	74,991,278	5,390	27,669	6,331	4,482
Total.....	\$54,782,064	\$171,753,069	\$18,294,762	\$78,911,566	5,698	31,083	28,861	27,017
Periodic gain.....	\$116,971,005				25,385		-1,844	
Division II.								
Suffolk.....	\$4,622,568	\$4,141,125	\$644,573	\$627,722	12	225	175,994	168,049
Queens.....	4,265,676	6,531,850	1,638,160	2,438,650	53	636	118,022	129,539
Richmond.....	9,604,021	8,800,783	68,514	96,917	6	294	19,792	21,266
Westchester.....	9,011,141	7,768,979	1,282,018	2,324,663	270	1,047	26,669	255,467
Rochester.....	1,954,359	1,504,214	254,906	354,287	55	280	42,611	62,120
Putnam.....	1,543,932	1,970,901	209,455	364,835	39	67	79,113	90,366
Orange.....	7,093,856	8,567,133	686,232	1,661,436	175	1,265	221,966	294,970
Ulster.....	12,149,116	13,787,494	1,804,840	4,005,183	248	940	342,811	365,702
Dutchess.....	1,940,652	4,457,240	319,064	611,120	105	659	134,035	185,056
Columbia.....	5,957,250	8,469,876	662,026	1,806,094	133	553	244,800	307,354
Greene.....	4,027,982	2,719,831	405,892	607,117	81	633	124,859	174,841
Rensselaer.....	6,469,840	7,070,537	736,327	3,350,957	164	2,081	211,276	263,324
Albany.....	6,886,351	9,060,370	745,232	4,440,536	321	3,381	159,907	207,484
Saratoga.....	5,987,728	5,405,468	555,875	970,662	258	861	219,467	288,226
Schenectady.....	1,575,871	1,815,623	294,262	578,222	104	728	58,785	78,197
Montgomery.....	5,447,224	3,578,907	398,237	674,899	63	1,285	216,106	305,876
Fulton.....	4,854,071	4,301,801	315,918	859,826	253	1,024	147,440	226,036
Herkimer.....	6,274,999	9,176,167	584,114	1,926,901	945	4,196	179,730	300,687
Oneida.....								
Total.....	\$90,666,636	\$101,118,189	\$11,505,675	\$27,999,067	3,404	20,175	2,728,483	3,724,560
Periodic gain.....	\$10,451,553				16,771		1,001,077	

Division III.

Madison.....	\$3,993,771	\$4,392,497	\$160,728	\$901,745	67	1,653	198,261	223,147
Onondaga.....	3,127,783	3,497,038	144,514	1,162,036	99	1,323	145,247	270,330
Cayuga.....	3,254,793	3,516,038	123,305	627,146	211	548	182,600	257,669
Seneca.....	3,036,353	3,631,036	149,277	732,965	37	323	131,648	131,648
Wayne.....	.....	1,393,465	.....	234,000	.....	684	34,899	153,530
Ontario.....	8,182,340	1,386,629	595,441	1,784,001	198	694	199,517	231,379
Monroe.....	.....	8,965,694	.....	1,213,631	70	2,484	78,849	239,357
Orieana.....	.....	4,178,166	.....	239,898	.....	333	22,577	117,885
Niagara.....	63,900,470	4,783,924	99,530	2,111,910	65	973	34,571	168,394
Erie.....	.....	5,838,400	.....	2,940,187	.....	5,172	46,655	162,594
Chautauqua.....	51,667,635	2,948,159	56,238	508,878	0	400	32,110	167,135
Livingston.....	.....	4,865,824	.....	521,913	.....	.....	.....	.....
Genesee.....	.....	8,839,263	.....	647,678	.....	.....	.....	.....
Yates.....	6,647,650	2,006,922	186,773	284,386	.....	.....	.....	.....
Total.....	\$33,842,798	\$78,222,645	\$1,494,896	\$11,430,474	741	14,590	926,304	2,043,308
Periodic gain.....	\$44,379,847		\$9,835,578		13,849		1,117,004	

New York State.

Total.....	\$212,293,932	\$403,517,585	\$33,320,232	\$125,058,794	15,101	82,319	5,717,494	9,655,426
Periodic gain.....	\$191,223,653		\$91,738,562		67,218		3,937,932	

^a No returns—total valuation estimated at four millions in the original.

^b Separate returns not made.

NOTE:—Valuation statistics taken from "Comptroller's Report" for 1836, Assembly Document No. 5, Table K. Population of Division III to compare with valuation data = 294,203 for 1820 and 542,543 for 1835. These figures include Yates, Livingston and Genesee counties.

TABLE NO. 23.
OCCUPATIONS IN DIVISIONS I, II AND III, AND NEW YORK STATE.

COUNTY.	NUMBER OF PERSONS ENGAGED IN—						
	AGRICULTURE.		MANUFACTURES AND HAND TRADES.		COMMERCE.		NAVIGATION.
	1820.	1840.	1820.	1840.	1820.	1840.	
Division I.							
Kings.....	840	3,234	713	6,160	81	1,770	1,443
New York.....	386	2,773	9,523	43,390	3,142	11,366	3,502
Total.....	1,226	6,007	10,236	49,550	3,223	13,135	4,945
Periodic gain.....	4,781		39,314		9,912		14,867
Division II.							
Suffolk.....	4,642	7,959	1,099	1,727	342	376	1,736
Queens.....	4,130	6,138	1,119	1,612	102	263	202
Richmond.....	4,480	8,444	294	786	209	346	651
Westchester.....	4,993	8,297	1,614	3,593	251	200	347
Rockland.....	1,474	2,545	755	1,154	52	100	170
Putnam.....	1,996	3,128	655	916	35	100	39
Orange.....	6,699	17,863	2,362	3,363	294	167	162
Dutchess.....	7,306	16,034	2,826	4,801	319	640	169
Ulster.....	3,351	7,774	9	3,220	16	343	590
Columbia.....	7,804	7,224	2,175	2,347	271	576	226
Green.....	4,627	6,071	996	2,236	155	199	199
Rensselaer.....	7,382	7,840	2,314	4,787	634	1,093	271
Albany.....	4,965	8,275	1,820	3,791	655	421	340
Saratoga.....	6,368	10,075	1,479	2,638	107	249	194
Schenectady.....	1,875	3,337	687	1,280	85	223	176
Montgomery.....	7,047	6,216	1,668	3,948	125	411	316
Fulton.....		8,037		1,281		99	

Herkimer.....	5,661	12,596	1,365	2,866	70	353	220
Oneida.....	10,111	16,297	2,575	6,229	184	675	557
Totals.....	90,721	156,570	25,812	52,565	3,706	6,538	6,489
Periodic gain.....	65,849		26,753		2,832		9,321

Division III.

Madison.....	5,884	9,631	1,085	2,382	77	158	88
Onondaga.....	6,968	11,741	1,640	4,930	120	681	528
Cayuga.....	7,695	10,995	1,773	2,942	127	478	193
Seneca.....	5,182	4,808	1,087	1,224	71	149	149
Wayne.....	7,563	10,137	1,689	2,203	134	160	192
Ontario.....	14,068	10,041	669	2,507	29	438	95
Monroe.....	5,809	6,835	181	5,164	5	745	453
Orleans.....	2,178	10,016	340	1,657	90	238	59
Niagara.....	4,015	11,022	.....	3,622	.....	289	78
Erie.....	1,892	12,195	207	2,088	16	863	426
Chautauqua.....						344	104
Total.....	51,681	104,984	8,148	29,765	669	4,573	2,365
Periodic gain.....	53,303		21,617		3,904		6,269

New York State.

Total.....	247,648	455,954	60,038	173,193	9,113	28,468	15,678
Periodic gain.....	208,306		113,155		19,355		35,033

TABLE NO. 24—A.
MANUFACTURING ESTABLISHMENTS IN DIVISIONS I AND III, AND NEW YORK STATE.

COUNTY.	MILLS.				Carding machines.				Iron works.		Trip hammers.		Distilleries.		Asberies.		Glass factories.	Rope factories.	Chain cable factories.	Oil cloth factories.	Dyeing and printing factories.	Clover mills.	Paper mills.	Tanneries.	Breweries.	
	Saw.		Oil.		Full- ing.		1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.
	Grist.	1821.	1835.	1821.	1835.																					
						1821.																					1835.	1821.	1835.
1821.	1835.	1821.	1835.	1821.	1835.		1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.	1821.	1835.		
Kings.....	15	11	98	1	27	1	1	1	2	1	10	7	139	1	15	...	3	3	1
New York.....	2	2	1	6	...	...	2	6	2	14	6	1	22	9	32	...	4	10	...	...	...	...	1	5	13
Total 1821.....	17	...	99	12	30	6	3	4	16	16	...	29	171	...	...	...	...	...	...	...	...	...	...	...	...
Total 1835.....	13	6	1	1	...	...	6	6	15	1	...	16	...	...	...	5	25	...	3	...	...	...	1	8	14
Total per 10,000 of the population.....	0.4	0.2	...	...	...	...	0.2	0.5	...	...	...	0.5	...	...	...	0.2	0.8	...	0.1	...	...	...	...	0.3	0.5
Division I.																										
Division III.																										
Madison.....	48	111	172	6	31	30	29	30	1	5	8	6	29	9	64	22	...	1	...	...	...	1	1	33	1
Onondaga.....	59	99	162	7	37	26	48	34	7	8	8	4	45	11	39	35	...	...	...	...	...	1	2	54	2
Cayuga.....	47	92	130	3	28	23	6	27	3	6	2	3	43	16	27	26	...	...	...	4	...	1	1	31	1

Seneca.....	32	16	52	4	12	10	18	10	...	1	...	2	1	22	6	23	8	...	...	...	5	1	16	1
Wayne.....	...	30	135	...	...	15	...	...	...	...	...	8	...	1	...	7	11	1	...	...	...	...	20	1
Ontario.....	66	44	87	7	42	21	43	23	6	...	...	6	13	56	12	29	16	...	...	...	...	1	23	2
Monroe.....	30	50	78	2	1	14	12	26	2	8	...	4	2	33	6	45	25	...	...	...	...	...	22	6
Orleans.....	10	16	17	...	...	4	6	...	...	...	...	...	...	6	5	12	8	...	...	...	...	...	11	2
Niagara.....	9	13	23	...	...	3	4	...	...	1	...	1	1	7	2	22	7	...	...	...	...	1	6	2
Erie.....	25	46	62	1	8	21	14	19	15	3	...	1	2	23	6	25	20	...	...	...	...	...	38	7
Chautauqua.....	30	52	74	1	2	6	7	26	...	5	...	2	...	17	11	9	15	...	...	...	...	1	46	2
Total 1821.....	356	743	...	31	185	197	...	36	...	...	25	...	37	280	295	...	...	...	...	...	...	...	...	...
Total 1835.....	...	393	1,248	...	20	204	229	...	57	...	55	...	26	87	193	1	...	...	...	...	...	9	8,300	27
Total per 10,000 of the population.....	...	8.5	2.70	0.4	4.4	4.9	...	1.2	...	1.2	...	...	0.6	1.9	4.2	...	...	...	...	...	0.2	0.6	5.0	6
<i>New York State.</i>																								
Total 1821.....	975	2,051	2,056	67	463	547	1,061	71	345	53	79	141	523	772	963	13	63	2	24	15	69	70	412	94
Total 1835.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Greene.....	46	37	89	144	2	18	20	16	1	4	2	3	2	1	4	3	16	3	...	...	...	...	...	...	...	2	32	1
Rensselaer.....	50	136	144	144	7	...	36	37	25	11	32	1	6	3	5	3	6	...	...	...	...	...	...	...	...	1	27	5
Albany.....	33	90	105	105	6	1	18	17	14	2	2	...	8	...	4	4	10	2	...	2	...	1	...	...	...	2	27	6
Saratoga.....	57	148	155	155	2	...	39	43	29	11	14	4	3	4	...	12	8	2	...	3	...	...	...	...	...	3	1	43
Schenectady.....	16	46	28	29	2	2	7	6	4	1	1	1	3	...	...	...	2	1	...	...	...	...	...	...	...	...	9	1
Montgomery.....	72	12	169	274	11	4	34	25	29	1	8	2	13	6	5	6	32	18	...	...	...	...	...	...	...	...	5	62
Fulton.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Herkimer.....	58	106	136	136	3	41	33	26	2	2	5	4	9	...	22	27	27	...	...	...	...	...	...	...	...	12	4	52
Oneida.....	64	147	241	241	9	56	62	35	19	27	27	5	3	4	32	38	38	...	...	...	...	...	...	...	...	1	2	4
Total 1821.....	988	1,516	...	...	68	429	582	106	106	106	106	45	62	62	217	232	232	...	...	...	...	...	...	...	...	...	...	...
Total 1835.....	...	812	1,768	1,768	16	300	347	347	205	205	205	92	92	50	107	75	75	...	...	...	...	...	...	...	...	5	14	27
Total per 10,000 of the population	12.3	...	26.8	26.8	0.2	4.5	5.3	5.3	3.1	3.1	3.1	1.4	1.4	0.8	1.6	1.1	1.1	...	...	...	...	...	...	...	...	0.1	0.2	0.4
																												0.6
																												7.1
																												0.5

TABLE NO. 25—A.

POPULATION OF SUBDIVISIONS II-A AND II-B.

COUNTY.	TOWNSHIP.	1814.	1820.	1825.	1830.	1835.	1840.	Area in acres.
<i>Subdivision II-A.*</i>								
Westchester	Yonkers.....	954	1,586	1,621	1,761	1,879	2,066	13,900
	Grenburg.....	1,636	2,064	2,001	2,195	2,266	2,361	19,800
	Mt. Pleasant.....	2,802	3,684	3,799	4,832	5,008	5,307	24,800
	Cortlandt.....	3,477	3,421	3,885	4,830	5,047	5,592	29,000
	<i>Total.</i>	8,045	10,744	10,802	15,718	16,047	19,266	87,800
Rockland	Orangetown.....	1,818	2,267	1,826	1,947	2,079	2,771	27,800
	Clarkstown.....	1,982	1,808	2,075	2,366	2,176	2,553	20,000
	Haverstraw.....	1,851	2,703	2,026	2,306	2,865	3,449	20,000
	<i>Total.</i>	5,551	6,778	5,927	6,651	7,120	8,773	60,000
Putnam	Philipstown.....	3,144	3,733	4,418	4,761	4,562	5,814	53,100
	Putnam Valley.....	954	1,586	1,621	1,761	1,879	2,066	13,900
	<i>Total.</i>	4,098	5,319	6,039	6,522	6,441	7,880	67,000
Orange	Cornwall.....	1,636	2,064	2,001	2,195	2,266	2,361	19,800
	New Windsor.....	4,115	5,812	5,768	6,424	7,683	8,533	23,500
	Newburgh.....	8,180	11,267	11,616	13,292	13,439	15,340	32,000
	<i>Total.</i>	13,931	19,143	19,385	21,911	23,388	26,234	74,300
Dutchess	Fishkill.....	5,810	8,263	8,635	9,222	9,529	10,406	63,000
	Poughkeepsie.....	5,873	8,263	8,635	9,222	9,529	10,406	19,800
	Beekman.....	4,360	4,257	2,808	1,584	1,447	1,400	15,400
	La Grange.....	.....	.....	2,415	2,044	1,927	1,851	25,000
	Union Vale.....	.....	.....	2,415	1,833	1,566	1,498	24,500
	Hyde Park.....	.....	.....	2,415	2,554	2,368	2,364	20,500
	Pleasant Valley.....	.....	.....	2,415	2,419	2,246	2,219	19,500
	Clinton.....	6,790	6,611	2,669	2,190	1,919	1,830	21,800
	Rhinebeck.....	2,805	2,729	2,735	2,938	2,824	2,829	21,700
	Red Hook.....	2,805	2,714	2,736	2,933	2,824	2,829	21,600
	<i>Total.</i>	30,653	30,240	30,697	35,090	35,903	37,665	245,800
Ulster	Marlborough.....	2,167	2,248	2,864	2,273	2,434	2,523	19,000
	New Paltz.....	4,027	4,612	4,706	5,705	5,480	5,408	19,000
	Esopus.....	1,400	1,513	1,520	1,770	1,629	1,639	16,000
	Kingston.....	2,898	2,956	3,010	3,170	3,057	3,094	38,000
	Saugerties.....	2,106	2,069	2,664	3,179	4,057	4,216	33,000
	<i>Total.</i>	13,598	14,084	14,884	17,063	18,639	19,110	170,000
Greene	Catskill.....	4,480	3,510	4,085	4,861	5,179	5,389	41,500
	Athens.....	.....	.....	2,038	2,425	2,587	2,587	19,500
	Coxsackie.....	2,370	2,356	3,028	3,373	3,864	3,864	26,500
	New Baltimore.....	1,984	2,036	2,171	2,370	2,395	2,396	26,000
	<i>Total.</i>	9,834	9,891	11,998	15,089	15,611	15,671	115,500

Columbia.....	1,013	1,164	1,146	1,203	1,166	1,231	13,100
Clermont.....	737	891	920	967	979	969	5,900
Livingston.....	1,437	1,938	1,988	2,087	2,206	2,190	22,800
Greenport.....	.....	.....	.....	.....	.....	1,161	.....
Hudson.....	4,725	5,310	5,004	5,392	5,531	5,772	14,200
Stockport.....	.....	.....	.....	.....	1,685	1,815	.....
Stuyvesant.....	.....	.....	.....	.....	.....	.....	23,400
Kinderhook.....	4,221	3,963	1,889	2,331	1,736	1,779	20,800
Schock.....	12,153	13,809	2,471	2,706	2,831	3,511	100,900
Greenbush.....	3,128	3,493	15,413	14,689	15,074	17,829	32,640
Troy.....	2,398	2,764	3,506	3,794	3,793	4,125	102,800
Leaningburgh.....	4,841	5,284	2,914	3,216	3,345	13,701	28,160
Brunswick.....	1,599	2,035	11,556	11,556	16,959	19,334	3,840
.....	2,233	2,318	2,423	2,693	2,268	3,446	5,060
.....	14,197	2,318	2,679	2,575	2,679	3,051	24,980
.....	4,325	15,874	19,180	25,804	30,044	33,667	91,660
.....	.....	5,114	6,643	6,092	3,103	3,238	72,750
.....	10,023	12,636	15,971	24,209	28,109	33,721	8,000
.....	2,564	2,806	3,574	4,065	6,961	10,141	29,670
.....	16,912	20,599	25,128	35,999	41,908	60,012	110,480
.....	.....	1,184	1,323	1,473	1,998	2,056	8,500
.....	5,123	4,024	4,233	2,042	2,146	2,710	48,000
.....
.....	5,123	5,808	5,556	6,006	6,186	7,108	16,500
.....	3,383	3,516	4,506	4,046	4,565	7,442	16,000
.....	7,134	3,936	4,808	4,268	6,272	6,784	7,500
.....	.....	1,829	1,593	1,481	2,110	2,584	23,000
.....	.....	2,314	2,273	2,497	3,027	3,086	20,000
.....	7,522	3,493	3,860	3,693	17,074	18,773	70,600
.....	2,297	3,743	2,689	3,538	2,866	5,214	20,600
.....	3,016	3,171	3,207	3,356	4,109	5,333	27,000
.....
.....
.....	5,154	5,366	1,976	2,451	2,612	3,672	22,500
.....	.....	.....	2,102	2,124	2,148	2,161	25,000
.....	.....	.....	2,806	2,750	2,913	2,962	.....
.....	3,907	4,677	3,664	4,347	4,671	5,641	35,600
.....	3,481	3,936	4,072	2,742	2,876	2,823	21,800
.....
.....	4,838	1,954	2,085	2,619	2,902	1,623	21,500
.....	22,696	21,846	25,600	23,237	26,138	26,364	165,600
.....	.....	.....	.....	.....	.....	737	.....
.....	6,373	6,527	7,359	7,700	7,557	5,409	126,500
.....	.....	.....	.....	.....	.....	346	.....
.....	.....	.....	.....	.....	.....	2,009	21,000
.....	2,380	3,045	3,025	1,818	2,146	2,169	38,000
.....	8,753	9,678	10,584	13,178	13,650	10,670	181,600

*Area in per cent of Division area = 24.1.

†Includes only a portion taken from Hudson and Stuyvesant; estimated.

TABLE NO. 25—A—(Continued).
POPULATION OF SUBDIVISIONS II-A AND II-B.

COUNTY.	TOWNSHIP.	1814.	1820.	1825.	1830.	1835.	1840.	Area in acres.
Subdivision II-A—(Continued).								
Herkimer.	Danube.....		3,187	3,275	1,724	1,983	2,129	32,000
	Stark.....		1,777	1,841	1,781	1,581	1,766	21,000
	Manheim.....				2,530	2,045	2,081	1,836
	Little Falls.....				2,205	2,043	2,369	27,000
	Fairfield.....		2,610	2,535	2,466	2,715	2,345	31,000
	Herkimer.....		2,327	2,665	2,620	2,670	3,094	20,000
	German Flats.....		1,294	1,860	2,074	2,153	1,798	25,000
	Frankfort.....		1,507	1,837	19,898	21,116	22,815	156,000
	Schuyler.....		10,880	16,991	8,323	10,183	12,782	3,300
	Utica.....			2,972	5,040	3,560	3,909	18,430
Oneida.	New Hartford.....		5,219	6,003	4,410	5,022	5,158	15,900
	Whitestown.....		3,069	2,531	4,266	4,505	5,680	41,600
	Rome.....		1,987	2,447	3,789	4,155	4,504	39,440
	Verona.....		10,804	14,807	24,457	297,987	31,941	118,780
Total.....								
Total.....		184,614	212,727	229,119	270,534	297,987	334,430	1,927,710
Periodic gain.....		28,113	16,392	41,415	27,453	36,433		
Subdivision II-B*								
Division II.....		459,071	531,743	554,264	621,784	659,408	733,347	7,997,440
	Subdivision II-A.....	184,614	212,727	229,119	270,534	297,987	334,430	1,927,710
Subdivision II-B.....		274,457	319,015	325,145	351,250	361,421	398,927	6,069,730
Periodic gain.....		44,558	6,130	26,105	10,171	37,506		

*Area in per cent of A Belt area = 314.8.

TABLE NO. 25—B.
POPULATION OF SUBDIVISIONS III-A AND III-B.

COUNTY.	TOWNSHIP.	1814.	1820.	1825.	1830.	1835.	1840.	Area in acres.
<i>Subdivision III-A.*</i>								
Madison.....	Lenox.....	2,349	3,360	4,326	5,039	5,314	5,440	54,500
Sullivan.....	Sullivan.....	1,897	2,932	3,140	4,077	4,366	4,390	42,500
Total.....		4,246	6,292	7,466	9,116	9,680	9,830	97,000
Onondaga.....	Manlius.....	4,241	5,372	6,005	7,375	7,594	7,509	64,000
	De Witt.....					2,716	2,802	
	Selma.....	1,241	1,814	3,833	6,929	7,793	11,013	24,300
	Camillus.....	3,377	5,791	7,108	9,518	8,006	9,937	64,000
	Onondaga.....	4,179	5,552	7,888	9,668	4,789	5,658	26,127
	Van Buren.....				2,890	2,963	3,021	
	Elbridge.....				3,357	3,599	4,647	
Total.....		13,038	18,629	22,834	28,727	30,460	36,607	178,487
Cayuga.....	Brutus.....	2,624	3,579	4,998	5,297	1,901	2,044	35,840
	Senett.....				4,144	3,069	2,041	
	Mentz.....	1,906	3,010	3,472	5,463	8,086	4,215	28,090
Total.....		4,530	6,589	8,470	10,760	9,046	6,250	63,930
Seneca.....	Tyre.....				1,482	1,527	1,506	
	Seneca Falls.....				2,603	3,786	4,281	
	Junius.....				1,587	1,517	1,584	
	Watertown.....	3,189	5,113	6,213	7,937	7,503	7,036	61,200
Total.....		3,189	5,113	6,213	7,937	9,046	10,417	61,200
Wayne.....	Savannah.....			6,452	7,980	9,324	10,417	61,200
	Galen.....		2,970	2,935	3,603	3,775	4,718	23,000
	Lyon.....	2,102	3,972	3,968	3,603	4,013	4,302	37,000
	Arcadia.....				3,427	4,090	4,980	24,000
	Palmira.....	2,964	3,724	3,613	3,427	3,526	3,549	32,000
	Macedon.....			1,903	1,989	2,506	2,398	21,130
Total.....		5,068	10,675	14,448	17,989	21,407	23,398	23,000
Ontario.....	Manchester.....			1,448	1,417	1,851	2,179	180,120
	Farmington.....	2,281	4,214	4,688	5,417	5,855	6,912	97,000
Total.....		2,281	4,214	6,136	6,834	7,706	9,092	25,400
Monroe.....	Ogden.....			4,451	5,364	5,823	6,024	52,400
	Parna.....	1,041	1,342	1,822	2,639	2,895	2,704	23,700
	Sweden.....		2,761	2,827	2,639	2,859	2,884	23,700
	Clarkson.....		1,612	2,620	3,451	3,836	3,563	39,000
	Perrinton.....	821	1,664	2,190	2,183	2,203	2,513	19,800

*Area in per cent of Division area = 31.9.

TABLE NO. 25—B—(Continued).
POPULATION OF SUBDIVISIONS III-A AND III-B.

COUNTY.	TOWNSHIP.	1814.	1820.	1825.	1830.	1835.	1840.	Area in acres.
<i>Subdivision III-A—(Continued).</i>								
Monroe.....	Pittsford.....	2,222	1,552	1,758	1,831	1,969	1,993	12,400
	Brighton.....	573	1,972	4,375	3,128	2,863	2,336	32,800
	Henrietta.....	.....	2,181	2,145	2,302	2,215	2,065	17,700
	Irondequoit.....	.....	.....	.....	.....	.....	1,232	.....
	Rochester.....	638	2,648	4,191	9,207	14,404	20,191	16,800
	Gates.....	.....	.....	1,547	1,484	3,265	3,669	39,000
	Greece.....	5,396	16,768	24,985	32,633	41,810	45,005	52,700
Total.....	.....	843	1,561	2,202	2,790	3,562	2,875	40,800
Orleans.....	Murray.....	.....	.....	.....	.....	.....	1,092	.....
	Kendall.....	.....	1,134	1,607	1,833	2,230	2,265	22,800
	Gaines.....	.....	.....	1,709	1,168	2,080	2,275	27,700
	Carlton.....	.....	1,767	3,681	4,801	5,182	5,539	49,400
	Barre.....	681	1,496	1,310	1,972	3,349	2,554	29,000
	Ridgeway.....	.....	.....	1,070	1,538	2,178	2,330	22,000
	Yates.....	.....	1,158	1,969	1,879	2,440	2,643	28,900
	Shelby.....	1,524	7,116	12,648	16,891	21,051	21,573	280,400
Total.....	.....	1,400	1,846	2,458	3,138	3,387	3,549	29,600
Niagara.....	Royalton.....	.....	.....	3,007	3,823	6,092	9,125	29,200
	Lockport.....	.....	.....	.....	572	1,069	1,098	18,400
	Pendleton.....	.....	.....	.....	1,712	2,070	2,099	24,000
	Cambria.....	585	1,134	2,239	.....	.....	1,057	.....
	Wheatfield.....	.....	.....	.....	1,401	2,013	1,277	36,500
	Lewiston.....	.....	484	919	1,528	2,302	2,533	30,500
	Niagara.....	.....	869	1,255	1,528	2,302	2,533	168,800
Total.....	.....	1,985	4,536	9,875	13,174	16,945	20,758	.....
Erie.....	Amherst.....	.....	768	1,308	2,489	4,376	2,451	56,000
	Tonawanda.....	.....	.....	.....	.....	.....	1,261	.....
	Buffalo.....	1,060	2,095	5,141	8,968	19,715	18,213	60,000
	Cheektowaga.....	.....	.....	.....	.....	.....	1,137	.....
Total.....	.....	1,060	2,863	6,449	11,167	24,091	25,068	116,000
Chautauque.....	Hanover.....	559	2,217	2,620	2,514	3,520	3,998	34,200
	Villanova.....	.....	.....	855	1,226	1,453	1,522	34,500
	Sheridan.....	.....	.....	.....	1,966	1,919	1,883	23,400
	Arkwright.....	.....	.....	.....	926	1,293	1,382	.....
	Pomfret.....	1,093	2,306	3,188	3,386	4,041	4,566	47,800
	Portland.....	797	1,162	1,999	1,771	2,181	2,136	32,600

Westfield.....	.....	1,111	.....	2,477	3,035	3,199
Ripley.....	.....	1,647	.....	1,647	2,096	2,197
<i>Total.....</i>	<i>.....</i>	<i>2,758</i>	<i>10,473</i>	<i>15,713</i>	<i>16,453</i>	<i>\$19,500</i>
<i>Total.....</i>	<i>.....</i>	<i>44,853</i>	<i>88,285</i>	<i>128,196</i>	<i>203,238</i>	<i>1,581,377</i>
Periodic gain.....	43,432	39,911	36,407	38,635	20,490	

Subdivision III-B.*

Division III.....	169,038	256,047	322,958	396,313	463,067	500,290	4,951,680
Subdivision III-A.....	44,853	88,285	128,196	164,603	203,238	223,728	1,581,277
Subdivision III-B.....	117,185	167,762	194,762	231,710	259,829	276,562	3,370,403
Periodic gain.....	50,577	27,000	36,948	28,119	16,733		

*Area in per cent of A Belt area = 213.1.

TABLE NO. 26--A.
STATISTICS FOR SUBDIVISIONS II-A AND II-B

COUNTY.	Township.	NUMBER OF PERSONS ENGAGED IN						ALIENS NOT " NATURALIZED.		ACRES OF IMPROVED LAND.			
		AGRICULTURE.		MANUFACTURES.		COMMERCE.		NAVIGA- TION.	1820.	1835.	1821.	1835.	
		1820.	1840.	1820.	1840.	1820.	1840.						
Subdivision II-A.													
Westchester.....	Yonkers.....	231	537	83	229	6	3	13	25	12,318	13,461		
	Greenburgh.....	310	491	108	211	31	37	22	32	16,981	17,748		
	Mt. Pleasant.....	487	731	185	475	54	62	95	21	22,022	23,005		
	Cortlandt.....	408	721	177	731	53	0	104	13	6,897	33,815		
Total.....		1,496	2,480	659	1,646	144	102	284	91	48,918	58,929		
Rockland.....	Orangetown.....	243	421	153	267	26	44	76	22	11,228	12,945		
	Clarkstown.....	444	727	152	163	7	17	34	7	9,965	20,364		
Total.....		334	590	160	537	18	30	59	9	20,965	20,364		
Putnam.....	Haverstraw.....	334	590	160	537	18	30	59	9	20,965	20,364		
	Philipstown.....	619	1,081	466	967	51	91	169	16	28,188	40,768		
Total.....		1,081	1,738	466	967	51	91	169	16	28,188	40,768		
Dutchess.....	Putnam Valley.....	619	1,013	463	51	8	51	38	34	15,084	21,364		
	Flaithill.....	1,204	2,339	521	1,513	8	68	58	34	16,084	21,364		
	Poughkeepsie.....	366	816	553	1,388	74	65	88	50	43,240	49,186		
	Beekman.....	639	602	184	70	110	262	1	6	17,572	22,297		
	La Grange.....	879	879	106	106	7	8	0	17	19,157	22,991		
	Union Vale.....	644	644	106	106	.....	9	0	13	.....	19,651
	Hyde Park.....	865	644	78	78	.....	11	15	49	18,968	17,259	
	Pleasant Valley.....	716	716	104	104	.....	12	1	45	16,006	16,006	
	Clinton.....	1,122	894	359	204	.....	12	1	45	10,899	15,522	
	Rhinebeck.....	427	848	166	196	26	16	14	3	22,441	20,112		
	Red Hook.....	45	797	146	179	33	34	19	10	18,831	15,402		
Total.....		3,809	9,390	1,289	5,924	290	468	167	207	168,568	207,886		
Orange.....	Corwall.....	237	624	199	293	33	0	34	20	6,887	9,990		
	New Windsor.....	404	845	139	119	20	0	4	15	91	10,000		
Total.....		685	1,061	472	697	128	0	47	42	18,033	23,584		
Ulster.....	Newburgh.....	1,486	2,450	810	1,709	181	0	55	77	53,480	64,980		
	Marlborough.....	411	605	3	200	1	17	22	9	9,436	11,736		
	New Pals.....	144	289	2	289	1	16	9	32	9,876	11,736		
	Esopus.....	130	280	1	89	0	28	35	2	7,237	8,533		

Water	247	752	2	159	138	8	71	9,478	10,255
Saugerties	206	861	0	42	44	2	279	11,873	18,764
Total	1,128	1,613	8	266	270	2	458	22,351	39,019
Greene	496	701	70	0	55	57	109	17,801	17,251
Catskill	316	333	20	3	65	11	87	16,884	6,115
Coxsackie	314	375	2	3	65	8	122	10,882	15,887
New Baltimore	425	664	25	0	195	35	32	13,453	15,847
Total	1,481	1,869	177	3	456	99	360	40,080	45,880
Columbia	323	260	16	11	11	8	8	11,880	17,913
Germanstown	204	167	36	11	16	7	2	3,626	6,447
Jayneson	542	430	8	10	16	0	2	3,626	6,447
Greenport	329	233	1	8	11	27	45	18,587	21,840
Hudson	18	612	139	241	116	35	111	18,491	12,226
Stockport	124	195	9	9	6	151	151	13,140	13,361
Stuyvesant	265	356	20	20	31	36	36	21,965	18,258
Kinderhook	435	282	50	50	166	19	575	68,519	95,391
Schockack	1,398	1,318	164	367	21	69	124	33,233	21,664
Greenbush	703	795	16	16	21	15	104	18,161	18,326
Troy	496	743	34	29	12	10	272	2,773	2,428
Lansburg	187	119	275	796	208	77	1,192	3,314	5,472
Brunswick	187	108	111	89	26	17	389	18,302	21,604
Total	8,028	8,718	0	15	369	123	1,625	68,783	76,494
Albany	943	1,356	476	945	17	23	1,356	31,706	19,219
Bethlehem	74	1,228	86	16	0	237	2,417	1,816	2,947
New Scotland	453	1,267	476	35	114	28	17	17,530	17,464
Albany	1,480	1,284	22	209	175	28	612	60,761	69,098
Watervliet	40	5,081	602	55	30	289	4,607	2,719	3,448
Waterford	617	131	16	14	69	2	69	30,810	28,338
Half Moon	40	652	0	14	12	4	43	1,438	17,937
Clifton Park	40	472	16	0	11	10	198	54,897	49,789
Niskayuna	697	1,265	52	69	111	10	10	3,058	3,832
Schenectady	103	195	1	5	4	4	10	3,238	7,550
Schenectady	209	437	76	199	57	91	315	6,317	11,942
Rotterdam	280	648	0	4	13	12	73	11,942	11,942
Glenville	435	853	4	3	2	25	274	15,032	11,868
Total	1,037	1,154	81	111	76	123	678	57,645	56,868
Montgomery	569	908	8	47	56	56	24	24,282	24,282
Florida	600	744	16	82	122	16	331	16,539	29,969
Amsterdam	535	413	1	20	4	21	21	16,369	16,369
Mohawk	649	433	11	57	56	9	3	36,311	18,834
Glen	570	211	10	10	1	29	29	24,968	30,481
Charlestown	1,028	688	52	42	31	12	80	25,751	25,751
Root	771	338	14	10	0	19	3	21,270	17,239
Canajoharie	866	771	11	10	0	19	3	21,270	17,239
Palatine	751	643	14	10	0	19	3	21,270	17,239
St. Johnsville	349	277	3	10	3	39	39	12,440	15,647
Minden	431	221	3	81	32	4	698	111,518	178,578
Total	4,165	6,216	63	411	316	64	698	111,518	178,578
Putnam	1,088	1,959	30	41	10	21	248	35,776	42,138
Johnstown	1,088	1,959	30	41	10	21	248	35,776	42,138
Bleeker	138	27	4	4	0	6	6	15,647	15,647

TABLE NO. 26—A—(Continued).
STATISTICS FOR SUBDIVISIONS II-A AND II-B.

COUNTY.	Township.	NUMBER OF PERSONS ENGAGED IN						ALIENS NOT NATURALIZED.		ACRES OF IMPROVED LAND.			
		AGRICULTURE.		MANUFACTURES.		COMMERCE.	NAVIGATION.	1890.	1835.	1821.	1835.		
		1820.	1840.	1820.	1840.	1820.	1840.						
Subdivision II-A—(Continued).													
Fulton.....	Ephraiah.....	623	780	140	91	.....	8	9	.....	26	.....	9,264
Total.....	Oppenheim.....	1,711	4,138	401	781	58	52	2	.....	141	13,005	18,270
Herkimer.....	Danube.....	567	399	106	197	58	5	27	84	491	45,731	70,696	
	Stark.....	.....	402	.....	141	.....	5	4	8	12	18,900	12,083
	Manheim.....	307	924	53	139	.....	6	10	.....	5	8,809	12,070
	Little Falls.....	.....	1,027	.....	486	.....	6	10	.....	115	.....	12,244
	Fairfield.....	561	1,062	90	69	.....	6	109	.....	154	.....	11,377
	Herkimer.....	420	1,122	222	158	15	6	13	.....	45	12,827	16,057
	German Flats.....	465	873	148	391	15	8	8	48	247	7,798	9,613	
	Frankfort.....	431	862	120	297	3	31	99	40	45	11,737	12,950	
	Schoharie.....	366	813	33	38	1	46	80	46	104	7,066	11,067	
Total.....	Utica.....	3,177	6,604	779	1,916	41	269	3	203	590	75,899	171,451	
Oneida.....	New Hartford.....	44	37	245	253	67	212	19	230	1,086	2,377	3,817	
	Whitesboro.....	773	690	467	1,279	.....	32	23	.....	90	19,183	13,481
	Rome.....	183	949	10	462	0	44	98	0	209	10,037	13,217	
	Verona.....	476	1,202	71	235	5	91	98	8	136	8,639	14,943	
Total.....	.....	1,476	3,606	803	3,015	104	481	377	337	1,193	40,899	66,907
Grand total.....	.....	27,964	53,862	11,447	30,194	2,290	3,984	3,053	1,769	14,165	919,245	1,261,714
Periodic gain.....	.....	25,898	18,747	.....	1,004	.....	.....	4,747	12,306	.....	342,469	.....
Subdivision II-B.													
Division II.....	.....	90,721	156,570	25,812	52,565	3,706	6,538	6,489	3,404	20,175	2,723,483	3,724,560
Subdivision II-A.....	.....	27,964	53,862	11,447	30,194	2,290	3,984	3,053	1,769	14,165	919,245	1,261,714
Subdivision II-B.....	.....	62,757	102,708	14,365	22,371	1,416	2,554	3,436	1,635	6,010	1,804,238	2,462,846
Periodic gain.....	.....	39,951	.....	8,006	.....	1,138	.....	4,574	4,375	.....	658,608	.....

TABLE NO. 26—B.
STATISTICS FOR SUBDIVISIONS III-A AND III-B.

COUNTY.	Township.	NUMBER OF PERSONS ENGAGED IN						ALIENS NOT NATURALIZED.		ACRES OF IMPROVED LAND.			
		AGRICULTURE.		MANUFACTURES.		COMMERCE.		1820.	1835.	1821.	1835.		
		1820.	1840.	1820.	1840.	1820.	1840.						
Subdivision III-A.													
Madison.....	Lenox.....	680	1,305	83	297	10	51	48	7	10,941	25,138		
	Sullivan.....	551	994	119	302	10	43	35	3	10,232	19,866		
Total.....	Manlius.....	1,231	2,492	202	629	40	94	85	148	21,773	44,994		
Onondaga.....	De Witt.....	833	966	185	651	23	107	112	5	12,713	17,170		
	Salina.....	111	684	166	166	21	21	29	54	10,661	10,661		
	Cannino.....	532	1,256	362	1,256	18	251	177	3	11,407	11,407		
	Onondaga.....	1,080	1,753	150	265	20	30	33	18	14,719	14,719		
	Van Buren.....	804	1,050	183	265	12	18	6	14	20,490	28,541		
	Elbridge.....	541	1,050	183	265	12	18	6	14	20,490	28,541		
Total.....	Brutus.....	2,808	4,247	880	339	75	55	50	5	65,615	108,982		
Cayuga.....	Sennett.....	901	1,588	146	170	1	498	421	10	15,334	15,334		
	Menis.....	678	1,110	186	340	11	51	45	14	15,659	15,659		
Total.....	Tyre.....	1,374	2,427	332	619	12	84	38	36	8,642	15,890		
	Seneca Falls.....	486	486	50	50	.....	73	3	23	24,301	39,512	
	Watkins.....	481	481	468	468	.....	73	104	5	7,012	7,012	
	Waterloo.....	1,050	1,229	239	238	26	1	0	6	15,570	15,570		
Total.....	Savannah.....	1,060	1,693	239	738	26	23	8	11	15,570	15,570		
Wayne.....	Galen.....	437	437	40	40	.....	0	.....	40	16,670	16,670
	Lyon.....	831	831	40	241	.....	0	.....	3	5,284	5,284
	Arcadia.....	968	968	0	328	16	0	30	86	5,994	16,059		
	Palmyra.....	748	748	314	314	48	39	39	5	12,901	12,901		
	Macedon.....	394	462	190	300	18	48	49	41	16,747	16,747		
Total.....	Manchester.....	1,716	3,463	190	127	54	70	34	9	16,292	12,646		
Ontario.....	Farmington.....	929	643	158	158	18	18	6	42	14,364	14,364		
		734	734	82	82	15	15	18	14	77,663	77,663		
Total.....		329	1,577	198	240	3	19	2	20	31,139	31,139		
									36	18,909	18,909		
									6	14,364	14,364		
									28	28,374	28,374		

TABLE NO. 26-B—(Continued).
STATISTICS FOR SUBDIVISIONS III-A AND III-B.

COUNTY.	Township.	NUMBER OF PERSONS ENGAGED IN						ALIENS NOT NATURALIZED.		ACRES OF IMPROVED LAND.				
		AGRICULTURE.		MANUFACTURES.		COMMERCE.		1820.	1840.	1820.	1835.	1831.	1835.	
		1820.	1840.	1820.	1840.	1820.	1840.							
Monroe	Ogden.....	532	109	.....	.....	.....	.....	11	18	.....	.....	3,940	15,027
	Parma.....	376	35	.....	.....	.....	.....	9	2	0	.....	3,105	14,192
	Sweden.....	798	120	.....	.....	.....	.....	2	3	1	.....	6,564	14,712
	Clarkson.....	819	32	.....	.....	.....	.....	7	3	.....	.....	8,538	18,221
	Perrinton.....	374	54	.....	.....	.....	.....	15	27	5	.....	6,112	10,087
	Pittsford.....	290	47	.....	.....	.....	.....	10	13	14	.....	4,221	11,556
	Brighton.....	527	70	.....	.....	.....	.....	6	18	46	.....	6,899	14,419
	Hewletta.....	613	116	.....	.....	.....	.....	4	4	.....	.....	.....	.....
	Irondequoit.....	323	38	.....	.....	.....	.....	0	.....	.....	.....	.....	.....
	Rochester.....	330	40	.....	.....	.....	.....	0	.....	.....	.....	.....	.....
	Gates.....	479	2,916	.....	.....	.....	.....	530	254	.....	.....	.....	.....
	Greece.....	8,682	296	.....	.....	.....	.....	3	30	.....	.....	.....	.....
	Murray.....	475	182	.....	.....	.....	.....	17	16	.....	.....	.....	.....
	Kendall.....	474	86	.....	.....	.....	.....	18	324	.....	.....	.....	.....
	Cassius.....	362	31	.....	.....	.....	.....	47	25	.....	.....	.....	.....
	Carleton.....	600	95	.....	.....	.....	.....	4	17	.....	.....	.....	.....
	Baire.....	556	97	.....	.....	.....	.....	21	17	.....	.....	.....	.....
Niagara	Bridgeway.....	436	281	.....	.....	.....	.....	9	0	.....	.....	3,783	11,649
	Yates.....	543	369	.....	.....	.....	.....	45	16	.....	.....	10,359	26,152
	Shelby.....	359	100	.....	.....	.....	.....	0	0	.....	.....	26,152	10,359
	Royanton.....	373	57	.....	.....	.....	.....	74	0	.....	.....	16,961	11,942
	Rockport.....	331	121	.....	.....	.....	.....	28	0	.....	.....	11,942	11,942
	Pondleton.....	2,433	959	.....	.....	.....	.....	8	0	.....	.....	6,876	18,921
	Cumbriss.....	17	176	.....	.....	.....	.....	3	0	.....	.....	19,175	109,669
	Wheatfield.....	196	893	.....	.....	.....	.....	23	3	.....	.....	16,004	16,004
	Niagara.....	60	99	.....	.....	.....	.....	0	29	.....	.....	14,228	16,313
	Lewiston.....	107	534	.....	.....	.....	.....	190	17	.....	.....	4,160	10,388
	Total.....	694	1,369	.....	.....	.....	.....	9	34	.....	.....	4,811	10,388
	Orleans	Ogden.....	532	109	11	18	3,940	15,027
		Parma.....	376	35	9	2	0	3,105	14,192
		Sweden.....	798	120	2	3	1	6,564	14,712
		Clarkson.....	819	32	7	3	8,538	18,221
		Perrinton.....	374	54	15	27	5	6,112	10,087
		Pittsford.....	290	47	10	13	14	4,221	11,556
Brighton.....		527	70	.....	.....	.....	.....	6	18	46	.....	6,899	14,419
Hewletta.....		613	116	.....	.....	.....	.....	4	4	.....	.....	.....	.....
Irondequoit.....		323	38	.....	.....	.....	.....	0	.....	.....	.....	.....	.....
Rochester.....		330	40	.....	.....	.....	.....	0	.....	.....	.....	.....	.....
Gates.....		479	2,916	.....	.....	.....	.....	530	254	.....	.....	.....	.....
Greece.....		8,682	296	.....	.....	.....	.....	3	30	.....	.....	.....	.....
Murray.....		475	182	.....	.....	.....	.....	17	16	.....	.....	.....	.....
Kendall.....		474	86	.....	.....	.....	.....	18	324	.....	.....	.....	.....
Cassius.....		362	31	.....	.....	.....	.....	47	25	.....	.....	.....	.....
Carleton.....		600	95	.....	.....	.....	.....	4	17	.....	.....	.....	.....
Total.....		694	1,369	.....	.....	.....	.....	9	34	.....	.....	.....	.....

Erie.....	156	427	31	97	1	14	3	1	636	3,969	8,798
Tonawanda.....	254	314	107	32	73	23	344	23	2,903	3,525	1,275
Buffalo.....	250	60	1,851	12	73	0	808	0	5,559	7,494	10,065
Cheektowaga.....	410	1,051	158	1,998	74	57	560	24	23	6,103	12,257
<i>Total</i>	338	940	35	279	2	15	2	0	12	6,103	5,494
Chautauqua.....	.....	514	47	79	.....	2	2	.....	16	.....	9,113
Hanover.....	.....	576	56	56	.....	8	4	.....	16	.....	6,341
Villanova.....	.....	444	30	30	.....	2	3	.....	21	2,558	11,143
Sheridan.....	309	890	337	90	6	78	22	0	30	4,093	9,083
Arkwright.....	166	652	31	202	4	12	9	.....	52	3,664	11,251
Pomfret.....	.....	701	14	107	0	75	6	0	24	16,418	7,359
Portland.....	180	596	189	1,148	18	244	82	0	194	280,467	72,031
Westfield.....	893	5,516	.....	.....	.....	.....	.....	.....	.....	.....	712,678
Ripley.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Total</i>	17,211	42,640	3,210	15,897	298	3,095	1,842	284	8,763	280,467	712,678
Grand total.....	25,429	.....	12,687	.....	2,797	.....	4,639	8,479	.....	432,211	.....
Periodic gain.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

<i>Subdivision III-B.</i>											
Division III.....	51,681	104,984	8,148	29,765	669	4,573	2,365	741	14,590	926,304	2,043,308
Subdivision III-A.....	17,211	42,640	3,210	15,897	298	3,095	1,842	284	8,763	280,467	712,678
Subdivision III-B.....	34,470	62,344	4,938	13,868	371	1,478	523	457	5,827	645,837	1,330,630
Periodic gain.....	27,874	.....	8,930	.....	1,107	.....	1,630	5,370	.....	684,793	.....

TABLE NO. 27—POPULATION.

PERIODIC PERCENTAGES OF INCREASE.

	1810 to 1814.	1814 to 1820.	1820 to 1825.	1825 to 1830.	1830 to 1835.	1835 to 1840.	1840 to 1845.
State of New York.....	7.0	23.7	17.7	19.0	13.0	11.7	†16.6
Division I.....	-1.4	30.7	34.0	25.9	32.8	19.3	†66.1
Division II.....	-0.07	15.8	4.2	12.2	6.1	11.2	†9.9
Division III.....	7.3	58.0	26.1	22.7	16.8	8.0	†12.4
Division IV.....	31.8	49.2	22.7	20.1	5.0	7.3	†5.1
Subdivision II-A.....	*	15.2	7.7	18.1	10.2	12.2	.....
Subdivision II-B.....	*	16.2	19.2	8.0	2.9	10.4	.....
Subdivision III-A.....	*	96.8	45.2	28.4	23.3	10.8	.....
Subdivision III-B.....	*	43.2	16.1	19.0	12.1	6.5	.....

TABLE NO. 28—POPULATION.

DENSITY PER SQUARE MILE.

	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1900.	†Area.
State of New York.....	19.1	20.4	27.3	32.1	38.3	43.3	48.3	145.0	50,203
Division I.....	943.0	929.0	1215.0	1628.0	2050.0	2722.0	3246.0	28,980.0	111
Division II.....	36.8	36.7	42.6	44.4	49.8	52.8	58.7	128.5	12,496
Division III.....	19.5	20.9	33.1	41.7	51.2	59.9	64.7	161.0	7,737
Division IV.....	10.8	14.2	21.3	26.1	31.3	35.0	37.6	51.7	14,134
Subdivision II-A.....	*	61.3	67.3	73.9	89.8	98.9	110.1	.....	3,012
Subdivision II-B.....	*	28.9	33.6	34.3	37.0	38.1	42.1	.....	9,484
Subdivision III-A.....	*	18.2	35.7	51.9	66.7	82.2	91.4	.....	2,471
Subdivision III-B.....	*	22.3	31.9	36.9	44.0	49.3	52.5	.....	5,266

TABLE NO. 29—POPULATION.

PERIODIC GAIN IN DENSITY.

	1810 to 1814.	1814 to 1820.	1820 to 1825.	1825 to 1830.	1830 to 1835.	1835 to 1840.	1840 to 1845.
State of New York.....	1.3	6.9	4.8	6.2	5.0	5.0	†2.1
Division I.....	-14.0	286.0	413.0	422.0	672.0	524.0	†2,144.0
Division II.....	-0.1	5.9	1.8	5.4	3.0	5.9	†5.8
Division III.....	1.4	12.2	8.6	9.5	8.7	4.8	†8.0
Division IV.....	3.4	7.1	4.8	5.2	3.7	2.6	†1.8
Subdivision II-A.....	*	6.0	6.6	15.9	8.6	11.7	.....
Subdivision II-B.....	*	4.7	0.7	2.7	1.1	4.0	.....
Subdivision III-A.....	*	17.5	16.2	14.8	15.5	9.2	.....
Subdivision III-B.....	*	9.6	5.0	7.1	5.3	3.2	.....

*Township figures for 1810 not available.

†On the assumption of a uniform increase, 1840-1900.

‡Area in square miles, from N. Y. S. census reports, 1875.

TABLE NO. 30—POPULATION.

	1810 to 1814.	1814 to 1820.	1820 to 1825.	1825 to 1830.	1830 to 1835.	1835 to 1840.	1840 to 1845.
INCREASE IN DENSITY ON BASIS OF INCREASE OF ENTIRE STATE = 1.							
State of New York.....	1.0	1.0	1.0	1.0	1.0	1.0	†1.0
Division I.....	-10.8	41.5	36.0	68.1	134.4	104.8	†234.7
Division II.....	0.08	0.9	0.4	0.9	0.6	1.2	†0.7
Division III.....	1.1	1.8	1.8	1.5	1.7	0.9	†1.0
Division IV.....	2.6	1.0	1.0	0.8	0.7	0.5	†0.1
INCREASE IN DENSITY ON BASIS OF INCREASE OF ENTIRE DIVISION = 1.							
Divisions II and III.....	*	1.0	1.0	1.0	1.0	1.0	.....
Subdivision II-A.....	*	1.0	3.7	2.9	2.9	2.0	.....
Subdivision III-A.....	*	1.4	1.9	1.6	1.8	1.9	.....
INCREASE IN DENSITY OF B BELT ON BASIS OF INCREASE OF A BELT = 1.							
A Belt (II and III).....	*	1.0	1.0	1.0	1.0	1.0	.....
Subdivision II-B.....	*	0.8	0.01	0.2	0.1	0.3	.....
Subdivision III-B.....	*	0.5	0.3	0.5	0.3	0.3	.....

TABLE NO. 31—POPULATION.

	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1900.
DENSITY PER SQ. MILE ON BASIS OF DENSITY OF ENTIRE STATE = 1.								
State of New York.....	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Division I.....	49.4	45.5	44.5	50.7	53.5	62.9	67.2	199.8
Division II.....	1.9	1.8	1.6	1.4	1.3	1.2	1.2	0.9
Division III.....	1.0	1.0	1.2	1.3	1.3	1.4	1.3	1.1
Division IV.....	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.4
DENSITY ON BASIS OF DENSITY OF ENTIRE DIVISION = 1.								
Divisions II and III.....	*	1.0	1.0	1.0	1.0	1.0	1.0	.....
Subdivision II-A.....	*	1.7	1.6	1.7	1.8	1.9	1.9	.....
Subdivision III-A.....	*	0.9	1.1	1.2	1.3	1.4	1.4	.....
DENSITY OF B BELT ON BASIS OF DENSITY OF A BELT = 1.								
A Belt (II and III).....	*	1.0	1.0	1.0	1.0	1.0	1.0	.....
Subdivision II-B.....	*	0.5	0.5	0.5	0.4	0.4	0.4	.....
Subdivision III-B.....	*	1.2	0.9	0.7	0.7	0.6	0.6	.....

TABLE NO. 32—POPULATION.

PERCENTAGE OF STATE'S POPULATION.

	1810.	1814.	1820.	1825.	1830.	1835.	1840.	1900.
State of New York.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Division I.....	10.9	10.0	9.8	11.2	11.8	13.9	14.8	44.2
Division II.....	47.9	44.7	38.7	34.3	32.3	30.3	30.2	22.1
Division III.....	15.7	15.8	18.7	19.9	20.6	21.3	20.6	17.2
Division IV.....	15.9	19.6	21.9	22.8	23.0	22.8	21.9	10.1

*Township figures for 1810 not available.

†On the assumption of a uniform increase, 1840-1900.

TABLE NO. 33.

ACRES IMPROVED LAND, ALIENS, OCCUPATIONS AND VALUATION OF PROPERTY.

Periodic Percentage of Increase.

	Acres land improved.	Unnaturalized aliens.	NUMBER OF PERSONS ENGAGED IN—				VALUATION PROP- ERTY.	
			Agriculture.	Manufac- tures.	Commer- ce.	Navigation.*	Real.	Personal.
	1821 to 1835.	1820 to 1835.	1820 to 1840.	1820 to 1840.	1820 to 1840.	1840.	1820 to 1835.	1820 to 1835.
State of New York.....	69.0	445.0	84.0	188.0	212.0	384.0	90.0	275.0
Division I.....	6.4	446.0	390.0	384.0	307.0	461.0	214.0	331.0
Division II.....	37.0	493.0	73.0	104.0	76.0	252.0	12.0	143.0
Division III.....	121.0	1,869.0	103.0	265.0	584.0	937.0	131.0	665.0
Subdivision II-A.....	37.2	706.4	92.6	163.1	73.9	206.9	.....	.....
Subdivision II-B.....	36.8	267.6	63.7	55.7	80.4	323.0	.....	.....
Subdivision III-A.....	154.1	2,985.6	147.7	395.2	938.6	1,556.7	.....	.....
Subdivision III-B.....	106.0	1,175.1	80.9	180.8	298.4	439.4	.....	.....

TABLE NO. 34.

ACRES IMPROVED LAND, ALIENS, OCCUPATIONS AND VALUATION OF PROPERTY.

Periodic Increase in Per Capita Data.

	Acres land improved.	Unnaturalized aliens.	NUMBER OF PERSONS ENGAGED IN—				VALUATION PROP- ERTY.	
			Agriculture.	Manufac- tures.	Commer- ce.	Navigation.*	Real.	Personal.
	1821 to 1835.	1820 to 1835.	1820 to 1840.	1820 to 1840.	1820 to 1840.	1840.	1820 to 1835.	1820 to 1835.
State of New York.....	0.4	2.7	0.8	2.7	0.5	1.1	\$30 90	\$33 30
Division I.....	-0.1	3.1	0.8	3.2	1.2	2.6	162 00	125 00
Division II.....	0.5	2.2	4.3	2.3	0.2	1.1	-17 60	20 80
Division III.....	1.0	2.9	0.8	2.8	0.7	1.1	29 10	16 00
Subdivision II-A.....	-0.1	3.9	3.0	3.6	0.1	0.2	.....	.....
Subdivision II-B.....	0.6	1.2	6.0	1.1	0.2	1.1	.....	.....
Subdivision III-A.....	0.6	4.0	-0.4	3.5	1.1	1.8	.....	.....
Subdivision III-B.....	2.6	1.8	2.0	2.1	0.3	0.4	.....	.....

*Navigation and commerce considered together in 1840.

TABLE NO. 35.
ACRES IMPROVED LAND, ALIENS, OCCUPATIONS AND VALUATION OF PROPERTY.
Figures per capita, or per 100 of the Population.

	Improved land, acres per capita.			Unnaturalized aliens per 100 of the population.	NUMBER OF PERSONS, PER 100 OF THE POPULATION, ENGAGED IN—								VALUATION OF PROPERTY PER CAPITA.			
					Agriculture.		Manufactures.		Commerce.		*Navigation.	Real.	Personal.		1835.	1835.
	1821.	1835.	1835.	1820.	1835.	1820.	1835.	1820.	1835.	1820.	1835.	1820.	1835.	1820.	1835.	
State of New York.....	4.0	4.4	1.1	3.8	18.0	18.8	4.4	7.1	0.7	1.2	1.8	\$155 00	\$186 00	\$24 20	\$57 50	
Division I.....	0.2	0.1	4.2	10.3	0.9	1.7	7.6	13.8	2.4	3.6	5.0	406 00	568 00	136 00	261 00	
Division II.....	5.1	5.6	0.6	2.8	17.1	21.4	4.9	7.2	0.7	0.9	1.8	171 00	153 00	21 70	42 50	
Division III.....	3.4	4.4	0.3	3.1	20.1	20.9	3.1	5.9	0.3	0.9	1.4	115 00	144 00	5 10	21 10	
Subdivision II-A.....	4.3	4.2	0.8	4.7	13.1	16.1	5.4	9.0	1.1	1.2	1.4	.....	.....	.....	.....
Subdivision II-B.....	5.6	6.2	0.5	1.7	19.7	25.7	4.5	5.6	0.4	0.6	1.5	.....	.....	.....	.....
Subdivision III-A.....	2.9	3.5	0.3	4.3	19.5	19.1	3.6	7.1	0.3	1.4	2.1	.....	.....	.....	.....
Subdivision III-B.....	3.7	5.1	0.3	2.2	20.5	22.5	2.9	5.0	0.2	0.5	0.6	.....	.....	.....	.....

*Navigation and commerce considered together in 1840.

TABLE NO. 36.
ACRES OF IMPROVED LAND, ALIENS, OCCUPATIONS AND VALUATION OF PROPERTY.

	Acres land improved.		Unnatu- ralized aliens.		NUMBER OF PERSONS ENGAGED IN—						VALUATION OF PROPERTY PER CAPITA.			
					Agriculture.		Manufac- tures.		Commerce.		Navigation.		Real.	
	1821.	1835.	1820.	1835.	1820.	1840.	1820.	1840.	1820.	1840.	1820.	1840.	1820.	1835.
State of New York.....	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Division I.....	0.05	0.02	3.8	2.7	0.05	0.09	1.7	1.9	3.6	3.0	2.8	2.6	3.1	5.6
Division II.....	1.3	1.3	0.8	0.7	0.9	1.1	1.1	1.0	1.1	0.7	1.0	1.1	0.8	0.9
Division III.....	0.9	1.0	0.3	0.8	1.0	1.1	0.7	0.8	0.4	0.8	0.8	0.7	0.8	0.2
<i>Per capita data, on basis of per capita data for entire state = 1.</i>														
Divisions II and III.....	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Subdivision II-A.....	0.9	0.8	1.3	1.7	0.8	0.8	1.1	1.2	1.6	1.4	1.4	1.4	1.1	4.5
Subdivision III-A.....	0.9	0.8	1.0	1.4	1.0	0.9	1.2	1.2	1.2	1.5	1.5	1.5	0.9	0.7
<i>Per capita data, on basis of per capita data for entire Division = 1.</i>														
A Belt (II and III).....	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Subdivision II-B.....	1.3	1.5	0.6	0.4	1.5	1.6	0.9	0.6	0.4	0.5	1.1	1.1	0.8	0.7
Subdivision III-B.....	1.3	1.5	1.0	0.5	1.1	1.2	0.8	0.7	0.7	0.4	0.3	0.3	0.8	0.4
<i>Per capita data of B Belt, on basis of per capita data for A Belt = 1.1</i>														

*Navigation and commerce considered together in 1840.

TABLE NO. 37.

ACRES IMPROVED LAND, ALIENS, OCCUPATIONS AND VALUATION OF PROPERTY

	Acres land improved.	Unnaturalised aliens.	NUMBER OF PERSONS ENGAGED IN—				VALUATION OF PROPERTY.	
			Agriculture.	Manufac- tures.	Commer- ce.	Navigation.*	Real.	Personal.
	1821 to 1835.	1820 to 1835.	1820 to 1840.	1820 to 1840.	1820 to 1840.	1820 to 1840.	1820 to 1835.	1820 to 1835.

Periodic increase in per capita data on basis of increase of entire State = 1.

State of New York.....	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Division I.....	0.3	2.3	1.0	2.3	2.2	2.3	5.2	3.8
Division II.....	1.3	0.8	5.4	0.9	0.4	0.9	-0.6	0.6
Division III.....	2.5	1.1	1.0	1.0	1.2	1.0	0.9	0.5

Periodic increase in per capita data on basis of increase of entire Division = 1.

Divisions II and III.....	1.0	1.0	1.0	1.0	1.0	1.0	.....	.....
Subdivision II-A.....	-0.2	1.8	0.7	1.6	0.6	0.2	.....	.....
Subdivision III-A.....	0.6	1.4	0.05	1.3	1.7	1.6	.....	.....

Periodic increase in per capita data of B Belt on basis of increase of A Belt = 1.

A Belt (II and III).....	1.0	1.0	1.0	1.0	1.0	1.0	.....	.....
Subdivision II-B.....	-6.0	0.3	2.0	0.3	2.0	3.0	.....	.....
Subdivision III-B.....	4.3	0.5	-5.0	0.6	0.3	0.2	.....	.....

TABLE NO. 38.

SHOWING PERCENTAGE OF TOTAL AREA UNDER CULTIVATION.

	1821.	1835.	Gain.
State of New York.....	17.8	30.1	12.3
Division I.....	40.6	38.0	-2.6
Division II.....	34.1	46.6	12.5
Division III.....	18.7	41.3	22.6
Subdivision II-A.....	47.7	65.5	17.8
Subdivision II-B.....	29.7	40.6	10.9
Subdivision III-A.....	17.7	45.1	27.4
Subdivision III-B.....	19.2	39.5	20.3

*Considering navigation and commerce together in 1840.

TABLE NO. 39.

SHOWING NUMBER OF ACRES OF IMPROVED LAND PER INDIVIDUAL ENGAGED IN AGRICULTURE.

	Improved land —1820 (extrapolated).	Improved land —1840 (extrapolated).	ACRES PER INDIVIDUAL.		Increase, acres.
			1820.	1840.	
State of New York.....	5,436,213	11,061,831	21.9	24.3	2.4
Division II.....	2,651,978	4,062,088	29.2	26.7	-2.5
Division III.....	846,618	2,442,238	16.4	23.3	6.9
Subdivision II-A.....	894,782	1,384,024	31.9	25.8	-6.1
Subdivision II-B.....	1,757,196	2,698,061	27.9	26.1	-1.8
Subdivision III-A.....	249,545	867,038	14.5	20.3	5.8
Subdivision III-B.....	596,923	1,575,200	9.6	25.3	15.7

TABLE NO. 40.

STUDY OF THE INCREASE IN SIZE OF MANUFACTORIES.

	Total number of establishments (of the ten original classifications).		Number of persons engaged in manufacturing —interpolated.		Number of persons per establishment.	
	1821.	1835.	1821.	1835.	1821.	1835.
Division I.....	387	59	12,202	39,723	31.5	673.3
Division II.....	4,245	3,772	27,150	45,877	6.4	12.2
Division III.....	2,185	2,512	9,228	24,361	4.2	9.7

TABLE NO. 41.

MOVEMENT OF VARIOUS ARTICLES ON THE ERIE CANAL FOR 1824.

ITEMS.	TO TIDE-WATER.			FROM TIDE-WATER.			Erie, east and west-bound.	Passages east and west at Utica.
	ERIE AND CHAM-PLAIN.	CHAM-PLAIN.	ERIE.	ERIE AND CHAM-PLAIN.	CHAM-PLAIN.	ERIE.		
Table of equivalents used in reductions from denominations given in original tables to tons of 2,000 lbs. See Canal Commissioners' report, 1827, page 32, etc.	Canal Commissioners' report, 1827, page 32.	Sen. Doc. 1835, No. 58, Table I.		Canal Commissioners' report, 1827, page 32.	Canal Commissioners' report, 1827, page 46.			Omitting "merchandise," this corresponds closely to the output of counties in Div. III.
		The figures for 1823 multiplied by 1½ to approximate to year 1824.	=(1) - (2).		Figures for 1823 multiplied by 1½ to approximate to 1824.	=(4) - (5).	=(3) + (6).	Sen. Doc., 1835, No. 58, Table D
	1	2	3	4	5	6	7	8
Lumber.....	Tons. 52,884	Tons. 50,458	Tons. 2,426	Tons. 72	Tons. 72	Tons. 72	Tons. 2,498	Tons. 5,217
Timber.....	4,822	35,385	.....	.....	.....	.....	.....	687
Shingles.....	947	630	317	4	.....	.....	313	174
Staves.....	6,615	95	6,520	3 tons per M.	.....	4	6,520	5,697
Ashes.....	5,784	111	5,673	5 bbls per ton.	.....	.....	5,673	5,660
Fur and pelts.....	.....	86	.....	.....	.....	.....	.....	116
Wood.....	17,058	.....	17,058	.....	.....	.....	17,058	.....
Hoop poles.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE No. 41—(Continued).

ITEMS.	TO TIDE-WATER.		FROM TIDE-WATER.			Erie. east and west- bound.	Passage east and west at Ulster.
	ERIE AND CHAM- PLAIN.	CHAM- PLAIN. ERIE.	ERIE.	CHAM- PLAIN.	ERIE.		
<p>Table of equivalents used in reductions from denominations given in original tables to tons of 2,000 lbs.</p> <p>See Canal Commis- sioners' report, 1827, page 32, etc.</p>	Canal Commis- sioners' report, 1827, page 32.	Sen. Doc. 1835, No. 58, Table I.		Canal Commis- sioners' report, 1827, page 32.	Canal Commis- sioners' report, 1824, page 40.		Omitting "merchan- dise," this corresponds closely to the output of counties in Div. III.
		The figures for 1823 multiplied by 1½ to approxi- mate to year 1824.	=(1) - (2).	Sen. Dec. 1835, No. 58, Table E.	Figures for 1823 multiplied by 1½ to approxi- mate to 1824.	=(3) + (6).	San. Doc., 1835, No. 58, Table D.
<p>Products of agriculture.</p>	1	2	3	4	5	6	7
	Tons. 1,215	Tons. 21	Tons. 1,104	Tons.	Tons.	Tons. 1,104	Tons. 711
Butter.....
Cheese and lard.....
Wool.....
Hides.....
Beef and pork.....
Flour.....
Wheat.....
Provisions.....
Cider.....
Flaxseed.....
Peas and beans.....
Clover and grass-seed.....
Hops.....
Coarse grain.....
Starch.....
Cotton.....
<p>Other products of agriculture.</p>

Domestic spirits.....	1,639	.....	.....	.....	1,629	.....	1,574
Beer.....	1,952	.....	.....	.....	1,952	.....	5,825
Salt.....	.....	.....	.....	.....	.....	.....	79
Glass.....	.....	.....	.....	.....	.....	.....	996
Furniture.....	.....	.....	.....	.....	.....	.....	.....
Lime.....	1,255	.....	.....	.....	1,255	.....	.....
Merchandise.....	336	.....	.....	.....	21,641	.....	22,146
Black lead.....	.....	.....	.....	.....	.....	.....	.....
Copperas.....	.....	.....	.....	.....	.....	.....	.....
Castings.....	.....	.....	.....	.....	.....	.....	.....
Iron and nails.....	.....	.....	.....	.....	.....	.....	.....
Iron ore.....	.....	.....	.....	.....	.....	.....	.....
Marble.....	.....	.....	.....	.....	.....	.....	.....
Whiskey.....	.....	.....	.....	.....	.....	.....	.....
Salt and plaster.....	.....	.....	.....	.....	.....	.....	.....
Gypsum.....	3,892	.....	.....	.....	3,892	.....	7,992
Brick.....	.....	.....	.....	.....	1,256	.....	.....
Stone.....	.....	.....	.....	.....	.....	.....	.....
Non-enumerated.....	.....	.....	.....	.....	.....	.....	.....
Oil.....	1,612	.....	.....	.....	3,720	.....	.....
2 cwt. 2 quarters to bbl.	140	.....	.....	.....	.....	.....	.....
Salted hides.....	.....	.....	.....	.....	.....	.....	.....
Oysters.....	.....	.....	.....	.....	.....	.....	.....
Water-cement.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	1,070

Manufactures.

Other articles.

TABLE NO. 42.
MOVEMENT OF VARIOUS ARTICLES ON THE ERIE CANAL FOR 1834.

ITEMS.	To Tons—Water.										From Tons—Water.									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Table of equivalents used in reducing from denominations given in original tables to report, 1837, page 32	Out of State, Exr. and Cham- plain—Sen. Doc., 1833.	Champlain—Sen. Doc. 1833.	(1) - (2).	Out of State, 1833—Sen. Doc. 1834, No. 70, Table F, No. 4.	Out of State, 1832—Amer- Dec., 1830, No. 36, Table C.	Out of State, 1834 Estimated or interpolated.	79 per cent of "Out of State, 1834."	(3) - (7).—Total, Exr. and Cham-plain.	Out of State, Exr. and Cham-plain—Sen. Doc., 1833, No. 68, Table E.	Champlain—Sen. Doc., 1833, No. 68, Table F.	(9) - (11).	Out of State, 1834—Amer- Dec., 1830, No. 68, pp. 1-2.	(11) - (12).—Total, Exr. and Cham-plain.	(3) + (13).—Total, Exr. and Cham-plain.	Passing Union, east and west—Sen. Doc., 1833, No. 68, Table I.	(6) + (12).—Total out of State.	80 per cent of "Total out of State."	(15) - (17).—Output of Div. merchandise, except for		
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
Lumber.	181,016	116,768	297,784	64,221	155,295	210	64,010	8,991	8,991	8,991	57,437	57,437	57,437	64,010	57,437	205	230	57,108	Total	
Timber.	28,810	19,816	48,626	484	264	265	8,991	5,084	5,084	5,084	30,433	30,433	30,433	30,433	30,433	265	230	30,433	Total	
Shingles.	8,719	830	9,549	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	8,991	Total	
Slaves.	32,676	420	33,096	7,925	1,690	7,100	5,909	46,947	46,947	46,947	31,248	31,248	31,248	46,947	31,248	7,100	6,300	24,893	Total	
Wool.	7,060	7,030	14,060	947	1,000	700	6,060	130	130	130	6,060	6,060	6,060	6,060	6,060	1,000	900	6,200	Total	
Asbes.	227	227	454	126	107	125	99	83,189	83,189	83,189	13,458	13,458	13,458	83,189	13,458	13,458	113	113	13,458	Total
Fur and pel.	96,642	12,665	83,977	230	107	125	99	83,189	83,189	83,189	13,458	13,458	13,458	83,189	13,458	13,458	113	113	13,458	Total
Wood.	34	788	822	4	29	5	4	30	30	30	193	193	193	30	193	5	4	193	Total	
Hoop poles.	193	193	386	4	29	5	4	30	30	30	193	193	193	30	193	5	4	193	Total	
Apples.	91	91	182	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	Total	
Charcoal.	91	91	182	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	Total	
Butter.	4,965	977	5,942	624	464	352	200	3,968	3,968	3,968	324	324	324	3,968	324	252	227	3,835	Total	
Cheese and lard.	128	128	256	371	3,572	60	47	3,224	3,224	3,224	83	83	83	3,224	83	556	60	502	Total	
Wool.	497	497	994	497	497	497	497	497	497	497	497	497	497	497	497	497	497	497	Total	
Hides.	6,241	605	6,846	784	464	1,385	1,004	4,539	4,539	4,539	260	260	260	4,539	5,098	1,355	1,247	4,451	Total	
Beef and pork.	6,241	605	6,846	784	464	1,385	1,004	4,539	4,539	4,539	260	260	260	4,539	5,098	1,355	1,247	4,451	Total	
Hops.	106,767	106,767	213,534	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	Total	
Flour.	106,767	106,767	213,534	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	106,767	Total	

Agriculture	Other products	Manufactures	Other articles	Tonnage (except salt)									
				24,665	24,665	24,665	24,665	24,665	24,665	24,665	24,665	24,665	24,665
Wheat.....	160 lbs. per bushel.			15	15	15	15	15	15	15	15	15	15
Provisions.....	7 lbs. per bu.			949	949	949	949	949	949	949	949	949	949
Butter.....	50 lbs. per bu.			473	473	473	473	473	473	473	473	473	473
Waxed.....	50 lbs. per bu.			562	562	562	562	562	562	562	562	562	562
Peas and beans.....	50 lbs. per bu.			2,911	2,911	2,911	2,911	2,911	2,911	2,911	2,911	2,911	2,911
Clover and grass-seed.....				14,559	14,559	14,559	14,559	14,559	14,559	14,559	14,559	14,559	14,559
Brain and ship stuff.....				30	30	30	30	30	30	30	30	30	30
Hops.....	50 lbs. per bushel.			813	813	813	813	813	813	813	813	813	813
Starch.....				78	78	78	78	78	78	78	78	78	78
Potatoes.....				5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515
Tobacco.....				292	292	292	292	292	292	292	292	292	292
Dried fruit.....				210	210	210	210	210	210	210	210	210	210
Domestic spirits.....	9 lbs. per gallon.			139	139	139	139	139	139	139	139	139	139
Merchandise.....				2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631
Black lead.....													
Copperas.....													
Castings.....													
Iron ore.....													
Iron and nails.....													
Whiskey.....													
Salt and plaster.....													
Beer.....	250 lbs. per bbl.			52	52	52	52	52	52	52	52	52	52
Salt.....	56 lbs. per bu.			1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707
Glass.....	28 lbs. per box.			291	291	291	291	291	291	291	291	291	291
Furniture.....				43	43	43	43	43	43	43	43	43	43
Gypsum.....				18,623	18,623	18,623	18,623	18,623	18,623	18,623	18,623	18,623	18,623
Brick.....													
Stone, lime, etc.....													
Non-enumerated.....													
Oil.....	2 crt. 2 quarts per bbl.												
Oysters.....													
Water-cement.....													
Ironware.....													
Pig iron.....													
Lead.....													
Sundries.....													
Manganese.....													
Paper and books.....													
Clay.....													
Coal.....													
Fish.....													
Grindstones.....													

† Authority for the assumption that 79 per cent of the out-of-State tonnage goes through from Buffalo to the Hudson (except salt) Senate Doc., 1887, No. 52, page 18.

TABLE NO. 43.
DETAILED MOVEMENT OF TRAFFIC ON THE ERIE CANAL ORIGINATING IN NEW YORK STATE, AND RELATIVE RANK OF MOVEMENTS OF DIFFERENT ARTICLES.*

ITEMS.	TOTAL INTERNAL TRAFFIC ON ERIE CANAL PASSING WEST TROT.			TOTAL INTERNAL TRAFFIC ON ERIE CANAL PASSING UTICA (REPRESENTING THE OUTPUT OF DIV. III).			RANK OF THE SEVERAL ARTICLES.			
	1824.	1834.	(1834) + (1824).	1824.	1834.	(1834). (1824).	FOR WHOLE ERIE.		PASSING UTICA - FROM DIV. III.	
Lumber.....	2,498	64,012	25.6	5,217	57,198	10.96	9	3	5	2
Timber.....	.....	8,991	.....	687	30,453	34.32	.....	9	19	5
Shingles.....	313	5,084	16.24	174	5,189	26.4	16	11	17	12
Staves.....	6,520	46,647	7.16	5,697	24,858	4.36	6	15	6	6
Asbes.....	5,673	6,050	1.07	5,650	5,200	0.92	6	10	7	14
Fur and pelt.....	.....	130	.....	116	84	0.74	.....	29	19	24
Wood.....	17,058	83,199	4.88	.....	13,458	.....	2	2	.....	7
Hoop poles.....	.....	30	.....	.....	34	.....	.....	34	.....	.....
Hemp.....	.....	193	.....	.....	27	.....	.....	27	.....	.....
Apples.....	.....	91	.....	.....	30	.....	.....	30	.....	.....
Charcoal.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	32,062	214,417	6.69	17,541	137,412	7.83	.....	.....	.....	.....
Butter.....	1,194	3,808	3.19	711	3,835	5.39	15	14	14	16
Cheese and lard.....	.....	324	.....	29	502	17.31	.....	22	21	21
Wool.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hides.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Provisions.....	3,466	4,339	1.31	2,734	4,451	1.63	8	13	9	16
Hops.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tallow.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	4,663	8,671	1.86	3,474	8,788	2.53	.....	.....	.....	.....

Agriculture.	Vegetable food.	Flour.....	15,395	105,519	6.85	16,386	124,637	7.01	3	1	2	1
		Wheat.....	8,542	23,142	2.71	8,207	33,399	4.07	4	6	3	4
		Oiler.....	.....	771	.....	199	.....	.....	.....	18	15	.....
		Flaxseed.....	.....	473	.....	.....	737	.....	.....	21	.....	19
		Pean and beans.....	.....	562	.....	.....	.....	.....	.....	19	.....	18
		Clover-seed.....	.....	.....	.....	.....	1,072	.....	17	19	.....	23
		Grass-seed.....	256	.....	.....	.....	.....	.....	.....	15	.....	.....
		Brann and ship stuff.....	.....	2,911	.....	.....	174	.....	.....	.....	.....	.....
		Total.....	24,193	133,378	5.51	24,792	160,039	6.46	.....	.....	.....	.....
		Hops.....	.....	135	.....	142	243	1.71	.....	28	18	22
Other products.	Other products.	Coarse grain.....	1,485	14,659	9.87	.....	10,055	.....	12	8	.....	8
		Starch.....	.....	267	.....	.....	.....	.....	.....	26	.....	.....
		Cotton.....	.....	513	.....	.....	.....	.....	.....	20	.....	.....
		Potatoes.....	.....	78	.....	.....	.....	.....	.....	31	.....	.....
		Tobacco.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Dried fruit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Total.....	1,485	15,652	10.54	142	10,298	74.5	.....	.....	.....	.....
		Total Agriculture.....	30,341	157,701	5.20	28,408	179,125	6.31	.....	.....	.....	.....
		Domestic spirits.....	.....	5,436	3.34	1,574	6,485	4.12	11	12	10	11
		Merchandise.....	21,641	62,423	2.88	22,146	54,711	2.47	1	4	1	3
Manufactures.	Manufactures.	Black lead.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Copperas.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Castings.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Iron and nails.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Iron ore.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Lime.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Marble.....	1,255	.....	.....	.....	.....	.....	14	.....	.....	.....
		Whiskey.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Salt and plaster.....	.....	52	.....	.....	.....	.....	.....	32	.....	.....
		Beer.....	.....	1,707	0.87	5,825	10,019	1.72	10	16	5	9
Total.	Total.	Salt.....	1,952	.....	.....	79	.....	.....	.....	20	12	.....
		Glass.....	.....	272	.....	996	.....	.....	.....	25	.....	.....
		Furniture.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Total.....	26,477	69,890	2.64	30,620	71,215	2.32	.....	.....	.....	.....

* Deduced from Tables 41 and 42

TABLE No. 43—(Continued).

ITEMS.	TOTAL INTERNAL TRAFFIC ON ERIE CANAL PASSING WEST TROY.			TOTAL INTERNAL TRAFFIC ON ERIE CANAL PASSING UTICA (REPRESENTING THE OUTPUT OF DIV. III).			RATE OF THE SEVERAL ARTICLES.		
	1824.	1834.	(1834) + (1834).	1824.	1834.	(1824) + (1834).	FOR WHOLE ERIE.		PASSING UTICA - FROM DIV. III.
							1824.	1834.	
Gypsum.....	3,892	43	0.01	7,992	5,307	0.67	7	33	13
Brick.....	1,256	17,456	.....	.....	8,304	.....	13	7	10
Stone.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Non-enumerated.....	3,720	.....	.....	197	.....	.....	18	16	.....
Oil.....	140	.....	.....	.....	.....	.....	.....	.....	.....
Oysters.....	.....	.....	.....	1,070	1,172	1.09	.....	.....	17
Water-cement.....	.....	.....	.....	.....	552	.....	.....	23	20
Ironware.....	.....	322	.....	.....	.....	.....	.....	.....	.....
Pig iron.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lead.....	.....	2,877	.....	.....	.....	.....	.....	.....	.....
Sundries.....	.....	811	.....	.....	.....	.....	.....	17	.....
Coal.....	.....	281	.....	.....	.....	.....	.....	24	.....
Clay.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	9,008	21,790	2.42	9,259	15,335	1.66	.....	.....	.....
Grand total.....	97,838	463,798	4.74	85,828	403,087	4.70	.....	.....	.....

CHRONOLOGICAL. RÉSUMÉ OF IMPORTANT LAWS AND EVENTS.

Tables, arranged chronologically, of important laws and events, connected with each of the following public improvements: The Erie, Champlain, Oswego, Cayuga and Seneca, Chemung, Crooked Lake, Oneida Lake, Chenango, Black River, and Genesee Valley canals, the Chenango canal extension, the Baldwinsville canal and Seneca River Towing-path, the Oneida River Improvement, the Cayuga (Montezuma) marshes, the Hudson river and the Shinnecock and Peconic canal.

ERIE CANAL.

- 1768 December 16. -- Governor Sir Henry Moore recommends improvement of the Mohawk river, but no action was taken by the General Assembly.
- 1784 November, — Plan of Christopher Colles for removing obstructions to the navigation of Mohawk river.
November 6, — Legislative committee commends plan of Colles, but deems its prosecution at public expense inexpedient.
- 1785 April 5, — \$125 appropriated to enable Colles to essay removal of certain obstructions from Mohawk river.
- 1786 Jeffrey Smith introduces bill in Assembly for navigation, Wood creek, Mohawk and Onondaga rivers, "*and if practicable extending the same to Lake Erie.*"
- 1791 Governor George Clinton urges upon the Legislature the necessity of improving natural water channels.
Joint committee advocates opening water communication between Mohawk river and Wood creek.
Chapter 53 — Commissioners Land Office to survey between Mohawk river, at Fort Stanwix, and Wood creek, and to prepare estimates for a canal.
Hardenburgh and Wright make survey.
- 1792 Chapter 40 — Western Inland Lock Navigation Co. incorporated to open navigation from the Hudson to Ontario and Seneca lakes.
Chapter 8 (2nd session) — Locks to be at least 70x10 ft.; navigation companies authorized to lease surplus waters.
January 3, — Commissioners report that the route from Albany to Seneca lake could be improved by locks and canals for \$200,000.
Surveys made by Western Co., Schenectady to Wood creek.
- 1793 Chapter 49 — Right of way limited to 20 ft. each side of canal.
Work begun in April at Little Falls.
Wood creek cleared, straightened and improved and its length shortened more than 7 miles.
- 1795 Chapter 38 — State Treasurer instructed to subscribe for 200 shares Western Co.'s stock at £20 each.
- 1796 Chapter 61 — Western Co. loaned £15,000 by State, on mortgage security.
Western canals opened from Schenectady to Seneca Falls for boats of 16 tons burden.
Freight charges reduced from \$100 to \$33 per ton.
Little Falls locks completed.
Wm. Weston makes examination and proposes plans for canal-locks around Cohoes falls, estimating cost at \$200,000.

- 1797 Chapter 36 — Western Co. authorized to borrow \$250,000.
October 3, — Canal from Mohawk river to Wood creek completed.
Report of companies to Legislature, containing Weston's report.
- 1798 Chapter 92 — Niagara Canal Co. incorporated, to construct a canal from Lake Erie to Lake Ontario, 6 miles long, 50 locks.
Chapter 101 — Western Co., allowed 5 years more.
- 1800 December 20, — Gouverneur Morris in a letter says ships may be made "to sail through the Hudson river to Lake Erie."
- 1802 Chapter 97 — Comptroller to accept shares Western Co. in payment of debts.
Western Co. proposes to improve navigation of Wood creek from Fort Stanwix to Little Canada creek, distant 6 miles, by a series of 4 locks and dams.
- 1803 Gouverneur Morris said to have urged the feasibility of "*tapping Lake Erie and leading its waters across country to the Hudson river.*"
Surveys, plan and profile, improvement Wood creek from Fort Stanwix to Little Canada creek completed by Benjamin Wright, also surveys of Mohawk river from Fort Stanwix to Schenectady.
- 1806 Chapter 77 — Western Co. granted an extension of 7 years time.
- 1807 January 14, — Jesse Hawley, in Pittsburg (Pa.) *Commonwealth*, enunciates the Erie canal idea, elaborating the same in *Genesee Messenger* in 14 articles, between October 27, 1807, and the following April.
- 1808 February 4, — Judge Joshua Forman offers a resolution in the Assembly for a canal joining the Hudson river and Lake Erie.
Survey ordered of a route between Hudson river and Lake Erie by Ontario and inland routes.
James Geddes appointed to make a survey from Hudson river to Lake Erie.
Chapter 222 — Grant west of Oneida lake, surrendered by Western Co. to State, accepted by State.
- 1809 January 20, — Report of James Geddes of explorations for canal route under concurrent resolution of March 21, and April 6, 1808.
- 1810 Commissioners appointed to examine inland waters by a joint resolution, March 18 and 15.
Chapter 193 — Appropriates \$3,000 for use of the commissioners.
Gouverneur Morris, Stephen Van Rensselaer, Wm. North, De Witt Clinton, Thomas Eddy, P. B. Porter and Simeon De Witt appointed first commissioners.
General P. B. Porter, of New York, offers a resolution in Congress urging the appropriation of public lands in aid of the construction of roads and canals.
- 1811 Chapter 188 — Appoints 9 commissioners to consider the matter of improving internal navigation.
February, — Commission reports, Lake Erie to Hudson river 310 miles; 525 ft. fall; estimated cost about \$5,000,000; on the inclined-plane principle.
Commission to invite co-operation of the United States and the individual states, \$15,000 appropriated for their use.
December 28, — President Madison submits copies of chapter 188-1811 to Congress and invites its aid.
- 1812 Chapter 231. — Commissioners under chapter 188-1811 to borrow \$5,000,000; also to purchase Western Co.'s property.
March 14, — Commissioners under chapter 188-1811 report; Western Co. demands \$190,000 for their property.
Massachusetts, Tennessee, Vermont, Ohio pledge their aid; New Jersey, Michigan, Connecticut do not favor the project.

- 1814 Holland Land Co. offers conditionally to donate 100,632 acres of land in Cattaraugus County, in aid of canal.
Sections 3, 4, 5, of chapter 231-1812, giving commission power to raise \$5,000,000, repealed.
Commissioners report engagement of Wm. Weston as engineer for proposed canal.
- 1816 Chapter 212 — Hudson and Mohawk Lock Navigation Co. incorporated, capital stock, \$500,000.
Chapter 237 — 5 commissioners appointed to provide communication by canals and locks between the Hudson and Lake Erie and Lake Erie and Lake Champlain.
March 21, —Favorable report of commissioners appointed in 1811.
- 1817 Chapter 262 — Construction authorized Mohawk river to Seneca river; contiguous lands to be taxed; canal fund; commissioners of canal fund formed and canal commissioners continued; commissioners may purchase rights of Western Co.
February 15, — Commissioners appointed pursuant to chapter 237-1816 present surveys and estimates for both canals.
June 27, — First contract let.
July 4, — Ground for the canal first broken at Rome, with fitting ceremony.
58 miles of the canal put under contract during the year, all on the summit level.
About 15 miles of canal completed during the year.
- 1818 Chapter 23 — Chitttenengo Canal Co. incorporated to build a canal from Chitttenengo to the Erie canal.
Chapter 120 — Governor to appoint a commissioner to survey and plan a harbor in Buffalo creek.
Discovery in America of hydraulic cement by Canvass White.
- 1819 Chapter 104 — Appropriates \$12,000 for harbor at Buffalo.
Chapter 105 — Completion of canal authorized Seneca river to Lake Erie and middle division to Hudson river, and canal laborers exempted from military duty.
Chapter 226 — Holland Land Co.'s grant of 100,632 acres of land in aid of canal accepted.
Work greatly retarded by an epidemic among the canal laborers, over 1,000 disabled in vicinity of Cayuga marshes.
Middle section of the canal from Utica to Seneca river and Salina side-cut completed, 98 miles.
December 10, — During past 4 months between 2,000 and 3,000 men with 500 teams and tools were employed in constructing the canal.
- 1820 Chapter 202 — Regulations for conduct on canal.
May, — Navigation opened on the middle section.
July 1, — Tolls first levied and collected.
Oct. 2, — Western Co.'s rights purchased by the State for \$91,616.
Fifty-one miles of western division about half completed.
Work on eastern section begun.
Nine miles of western section filled with water.
- 1821 Chapter 36 — Commissioners to borrow not over \$1,000,000 in 1821 and \$1,000,000 in 1822.
Chapter 221 — Ontario Canal Co. incorporated to build a canal from Canandaigua lake to Erie canal.
Chapter 240 — Canal commissioners to act as canal appraisers.
Canal completed from Utica to Little Falls.
Fifty miles western section completed.
- 1822 Chapter 251 — Buffalo and Black Rock harbors to be improved.
Chapter 273 — Canal material exempted from execution.
Chapter 274 — Speed on canal limited to 4 miles per hour.

- 1822 Canal completed from Little Falls to Schenectady.
One hundred and twenty miles of navigation open.
Genesee river feeder completed, lock at head.
Collectors' offices established.
Canal filled, Rochester to Pittsford; 180 miles open.
Feeder and aqueduct at Little Falls completed.
Schoharie creek dam completed, 650 ft. long; founded on piles and built of timber and stone.
- 1823 Chapter 96 — \$1,300,000 appropriated for canal fund.
Chapter 111 — Canal basin to be built at Albany.
Chapter 133 — Niagara Canal Co. incorporated.
Chapter 269 — Salary, canal commissioner fixed at \$2,000 per year.
Aqueduct over Genesee river completed, 802 ft. long, 11 arches.
Salina side-cut connected with Onondaga lake.
October 8, — First boats from the west and north pass through the canal into the Hudson at Albany, amid great enthusiasm.
Feeder dam built at Johnsville.
Canal completed from Rochester to Brockport and Schenectady to Albany.
- 1824 Chapter 255 — \$1,000,000 appropriated for canal fund.
Canal completed, Brockport to Lockport.
Three hundred bridges built across the canal between Utica and Albany and 80 between Utica and Little Falls.
Tonawanda feeder completed.
Niagara river lift-lock completed.
Hydrostatic locks built at Utica and Syracuse.
Three thousand houses built in New York City during the year.
April 12, — De Witt Clinton removed from office of canal commissioner by concurrent resolution.
- 1825 Chapter 236 — "Great canal act" authorizes surveying and estimating 17 canal routes.
Chapter 275 — Canal appraisers appointed.
Chapter 277 — Commissioners to build canal from Squaw Island to Buffalo creek.
Chapter 292 — \$270,965.78 appropriated for canal fund.
October 26, — Erie canal completed; opening ceremonies were celebrated with the greatest enthusiasm all along the line; fleet entered canal at Buffalo for New York on trip of celebration.
Whole number of boats and rafts which passed on the canal during season, 13,110.
Number of persons passing Utica in freight and packet boats during season, over 40,000.
Troy dam damaged and Adams island partly carried away by spring floods.
Petitions from 12 counties and 18 towns and cities against navigating the canal on Sunday.
Hydrostatic locks for weighing laden canal-boats prove wonderfully efficient.
- 1826 Chapter 240 — Commissioners to lay out side-cut to Montezuma, to be built by salt manufacturers.
Limestone creek and Mohawk river feeders, with dams, locks, etc., completed.
Black Rock pier damaged.
Eighty bridges rebuilt on an enlarged and more substantial plan.
Population New York City, 250,000.
Canal board established.
- 1827 Chapter 9 (R. S.) — Maps to be made of all existing canals; Erie canal declared completed.
New lift-lock at Fort Plain completed.
Black Rock pier damaged.
January 7, — Canal commissioners met and organized under the law reducing the number of commissioners to two.
Genesee river feeder dam raised 14 inches.
R. S. Title 9, Art. 3, defines powers and duties of canal appraisers.

- 1828 Chapter 40 — Lock and waste-weir at Rome to be rebuilt.
Pier built at Black Rock harbor, 375 ft.
New brush and gravel dam built on Schoharie creek.
New lock built at Lyons.
Raceway at Lockport completed.
Navigable season, March 27 to December 20, a period of 269 days. (Longest recorded.)
February 11, — Death of De Witt Clinton, Governor of the State of New York.
- 1829 Weigh-lock at Utica completed.
- 1830 Number of boats arriving and departing from Albany during the season, 12,890.
- 1831 Number of boats arriving and departing from Albany during the season, 14,968.
- 1832 Hutchinson's surveys and maps, Canastota to Hudson river.
Schoharie creek dam rebuilt.
March, — Ice swept along by floods badly damaged Schoharie creek dam.
Cost transportation of bushel of wheat, Albany to Rochester, 22.4 cents; barrel of flour, 80 cents.
- 1833 Chapter 312 — Nine Mile creek feeder to be made navigable.
Report of commissioners on rebuilding Rochester aqueduct, doubling locks east of Syracuse and new feeder on Jordan level.
Commissioners reduce tolls going to tide-water 28½ per cent and 14½ per cent going from tide-water.
Port Byron aqueduct fitted with a new trunk.
- 1834 Chapter 312 — Commissioners to build second set of locks Albany to Syracuse, and rebuild Genesee aqueduct, 40 ft. wide.
West Troy and Syracuse weigh-locks rebuilt of stone laid in hydraulic cement.
- 1835 Chapter 274 — Commissioners to enlarge canal and construct double locks.
Skaneateles feeder enlarged.
Lock No. 8, Lockville, rebuilt of cut stone.
Enlarged canal to be 70 ft. wide at surface, 7 ft. deep; locks, 110 ft. between quoins, 18 ft. wide.
- 1836 Chapter 210 — Separate canal to be built at Rome.
Chapter 287 — Governor, with consent of Senate, to appoint 3 canal appraisers.
Estimated cost of enlargement, in report of canal board, \$12,416,150.17.
March 28, — Report of canal board on ship canal.
First enlargement work let and commenced.
Rochester aqueduct begun.
Albany basin partially cleaned, and deposits and other obstructions removed.
- 1837 Chapter 470 — Part of abandoned canal to be transferred to Cohoes Co.
Work commenced on widening canal at Utica.
One hundred and forty ft. of Black Rock pier carried away.
Albany basin improved, channel 60 ft. wide, 5 ft. depth of water secured.
June 21, — Break at Otter creek, 26,000 cubic yards earth washed out; navigation suspended 9 days.
June, — 220 ft. Troy dam carried away; cause not known; cost of repairs about \$13,000.
Rates of toll 89 3-10 per cent lower than in 1832.
- 1838 Chapter 116 — Buffalo to build Hamburg St. canal.
Chapter 247 — Commissioners to improve Tonawanda and Ellicott creeks.
Chapter 269 — Commissioners to borrow \$4,000,000 for enlargement.
Enlargement of Genesee river feeder with guard-lock completed.
Jordan level to be cut down.
Feeder to be built at Nine Mile creek.
New pier built at Black Rock, 1,947 ft.

- 1839 April 23. — Commissioners to survey Hamburg St. canal.
Sea wall 470 ft. long built on Lake Erie.
Wall 478 ft. long built on Little Buffalo creek.
Lock at Lyons completed.
- 1840 Chapter 37 — Commissioners to borrow \$500,000 for completion.
Chapter 161 — Commissioners to borrow \$2,000,000.
Chapter 307 — Commissioners to complete Hamburg St. canal.
Tonawanda and Oak Orchard feeder enlarged, cost \$18,078.60.
Wall at Buffalo extended 1,300 ft.
Double locks No. 33 and No. 47, two at Syracuse and one at Lockville completed.
February. — State dam, Troy, badly damaged by flood, cost of repairs, \$7,728.60.
- 1841 Chapter 194 — \$2,150,000 to be borrowed for enlargement.
Chapter 218 — Canal department located in State Hall, Albany.
Masonry of locks, Albany to Little Falls, completed.
Port Jackson and Schoharie creek aqueducts completed.
Nine Mile creek and Carpenter brook feeders finished.
New Utica weigh-lock completed.
"Erie Canal Enlargement and Black River and Genesee Valley Canal Completion Co." offer to complete canals within three years from January 1, 1842.
- 1842 Chapter 114 — "Stop law," all work excepting necessary repairs stopped.
Proposal by Childs to use Skaneateles lake as reservoir. |
Rochester enlarged aqueduct completed, 800 ft. long, cost \$445,347.
New upper and lower aqueducts across Mohawk completed.
Genesee feeder completed.
North tier of combined locks at Lockport completed.
- 1843 Chapter 30 — Bridges to be built at Buffalo and Fitzhugh Sts., Rochester.
Rotterdam St., Schenectady, and Water St., Albany.
Improvement of Hamburg and Skinner canals completed.
January. — Schoharie creek dam damaged by flood, 100 ft. swept away.
Rights of Buffalo in Main and Hamburg canal conveyed to the State.
- 1844 Chapter 278 — Unfinished work to be repaired and improved for naviga'
Steele's aqueduct completed.
Skaneateles lake reservoir completed.
October 18. — Waters of Black Rock harbor raised 10 ft. by gale, sweeps away the upper end of Squaw island and partly wrecks the pier. Damages, \$20,000.
- 1845 New canal at Schoharie creek brought into use.
Jordan level completed.
- 1846 Chapter 325 — Bottom of level east of Rochester to be reduced.
Constitution, Art. VII, Sec. 6. — Canals never to be sold, leased or otherwise disposed of.
October 28. — Death of Jonas Earll, president board of canal commissioners.
March. — Bad break in the Schenectady level; Mohawk river, ice laden, pours into canal; cost of repairs, \$10,191.48.
- 1847 Chapter 217 — Bridges to be built at Washington and Michigan Sts., Buffalo.
Chapter 259 — Enlargement to be again begun; \$300,000 appropriated; also \$417,620.37 if available.
Chapter 286 — Jordan level to be drained.
Chapter 318 — Bridge to be built at Alexander St., Rochester.
Chapter 418 — Abandoned conal, near junction with Champlain, to be conveyed to adjoining owners.
Chapter 445 — \$559,000 appropriated.

- 1847 Van Vleck's survey for reservoirs; Limestone creek, 580 acres, 604,517,540 cu. ft.; Cazenovia lake, 1,178 acres, 257,483,100 cu. ft.; Chittenango creek, 814 acres, 292,438,290 cu. ft.
Feeder at Jordan level completed.
November 2, — Charles B. Stuart elected first State Engineer and Surveyor under the Constitution.
1,514 new boats registered during the year, making a total of 4,000 to date.
- 1848 Chapter 72 — Prescribes powers and duties of State Engineer and Surveyor.
Chapter 162 — Creates the office of auditor, canal department.
Chapter 213 — \$810,000 appropriated for enlargement.
Chapter 288 — Obstructions below lower Black Rock dam to be removed.
Chapter 334 — Bridge to be built at Allen St., Rochester.
Chapter 339 — Reservoir to be built at Conesus lake.
Chapter 364 — Bridge to be built at Washington St., Rome.
Canal bottom east of Rochester to first lock, depressed one foot.
"Big bevel" dispensed with on locks.
Bench walls on canals superseded by walls of full length.
- 1849 Chapter 181 — Bridge to be built at Church St., Medina.
Chapter 200 — State to acquire Albany basin; \$121,462.63 appropriated.
Chapter 217 — \$920,000 appropriated for enlargement.
Chapter 219 — \$50,000 of chapter 260-1847 reappropriated.
Chapter 233 — Locks, Syracuse to Rochester, to be lengthened temporarily.
Lyons aqueduct completed.
4,863 boats on canals.
- Chapter 198 — Bridge to be built near Shelby basin.
Chapter 214 — Canal at Geddes to be abandoned.
Chapter 219 — Commissioners to acquire Smith's bridge, Rochester, and Brandon Howell St. bridge.
Chapter 234 — Bridges to be built at McBride and Townsend Sts., Syracuse.
Chapter 238 — Bridge to be built at Genesee St., Buffalo.
Chapter 268 — Live stock may be carried on the railroads free from canal tolls.
Chapter 354 — \$654,000 appropriated for enlargement of canal through Brockport, Albion and Medina.
West Troy basin and upper side-cut completed.
Erieville reservoir completed.
- First annual report State Engineer to the Legislature.
February 12, — Canal commissioners report as to status of enlargement of the lateral canals.
- 1851 Chapter 200 — Bridge to be built at Jay St., Rome.
Chapter 316 — Bridge to be built at Ingersoll St., Albion.
Chapter 485 — Surplus revenues to be applied to completion by "canal-revenue-certificate" plan.
Chapter 497 — Abolishes canal tolls on railroads.
- 1852 Chapter 122 — Bridge to be built over the locks at Lockport, Pine and Lock Sts.
Black Rock ship canal completed.
Court of Appeals declares chapter 485-1851 unconstitutional.
- 1853 Chapter 227 — Bridge to be built at Ferry St., Troy.
Chapter 322 — Bridge to be built at Hospital St., Buffalo.
Chapter 326 — Bridges to be built at Chestnut St., Syracuse, and Geddes St., Geddes.
Chapter 447 — Bridge to be built at Seymour St., Tonawanda.
Chapter 620 — \$390,000 appropriated.
Iron bridge built at Whitesboro St., Utica.
New canal opened, Port Byron to Montezuma.
Pitt lock, Berlin lock, Pittsford lock and Brighton lower lock, widened and lengthened.

- 1853 Navigable season, April 20 to December 20, a period of 245 days, excepting 1828, the longest in canal history.
- 1854 Chapter 16 — \$100,000 appropriated for bottoming out canal.
 Chapter 327 — Repairs to be let by contract.
 Chapter 329 Contracting board created.
 Chapter 330 — \$1,831,000 appropriated for fiscal year.
 Constitution, Art. VII, Sec. 3, — Legislature to appropriate annually for enlargement of canals.
 Feeder dam, 1,547 ft. long rebuilt, cost \$8,163.51.
 Crane brook aqueduct rebuilt.
 Certain sections of old canal widened, deepened and straightened pursuant to chapter 16-1854; cost about \$100,000.
 Failure of wheat crop causes a large diminution of canal revenues.
- 1855 Union St. bridge, West Troy, rebuilt.
 New trunk put in Schoharie creek aqueduct, cost \$32,899.68.
 Lasher's, Yates' and Printup's aqueducts enlarged.
 Forty-four sets of double locks completed between Albany and Montezuma.
 Thirteen single locks and 6 sets of double locks completed between Montezuma and Buffalo.
 Iron bridges built at Exchange, Washington and Buffalo Sts., Rochester.
 Thirty-three aqueducts completed.
 Canal between Rome and Higginsville, abounding in sharp curves known as the "Black Snake," straightened.
 Seeley's apparatus for manipulating lock-gates put in at Albany weigh-lock; very successful.
- 1856 Chapter 29 — Bridge to be built at Vernon St., Middleport.
 Chapter 130 — Bridge to be built at Nelson St., Rochester.
 Chapter 131 — Bridges to be built at Doxtater and Bouck Sts., Rome.
 Chapter 148 — \$1,803,000 appropriated for fiscal year.
 Estimate for Limestone creek reservoir, De Ruyter, 500,000,000 cu. ft., \$118,367.55.
 Seneca river aqueduct completed.
 Rocky rift dam and feeder and Mohawk dam and feeder at Rome completed.
 Chittenango creek aqueduct completed.
 Casenovia dam rebuilt.
 Enlargement suspended, no funds.
 December, — Break at Squaw Island, Black Rock harbor; high water caused by gales overflows banks; damages \$12,000.
- 1857 Chapter 105 — Contracting board to divide canals into subdivisions and residencies; powers of board increased.
 Chapter 176 — Bridge to be built at Geddes St., Geddes.
 Chapter 211 — Bridge to be built at Ferry St., West Troy.
 Chapter 365 — \$2,257,492.12 appropriated.
 Chapter 538 — Creating office and fixing number of canal appraisers at three.
 Chapter 633 — State Engineer to appoint and prescribe powers and duties to Deputy State Engineer.
 Chapter 702 — Bridge to be built at Grove Spring.
 Chapter 714 — Bridge to be built at Frankfort.
 Chapter 742 — Bridge to be built at Mill St., Little Falls.
 Chapter 743 — North sections 196 and 197 to be built; old canal east of Port Byron to be abandoned.
 Eastern division locks all enlarged and double except Nos. 2 and 42.
 Middle division completed, except from lock 51 to Port Byron and from Clyde river to Wayne County line.
 Western division in use, excepting sections 207, 256, 259, 289.
- 1858 Chapter 87 — Old canal west of Owasco outlet and east of Port Byron to be abandoned.
 Chapter 184 — Bridge to be built at Griffin St., Rochester.
 Chapter 272 — Bridge to be built at Hamilton St., Buffalo.

- 1858 Chapter 298 — Bridge to be built at White St., Cohoes.
 July 6, — Death of S. S. Whallon, president board canal commissioners in charge of western division.
 Break near Schenectady; culvert gives way; damages \$5,991.41.
 Four hundred and thirty boats caught in the ice on eastern division at close of season; cost to State moving them to tide-water, \$20,000.
- 1859 Chapter 16 — Amending Revised Statutes concerning penalties for violation of regulations governing canal navigation.
 Chapter 149 — \$412,150 appropriation for enlargement.
 Chapter 227 — Releases State's interest to a portion of abandoned Erie canal at Rochester.
 Chapter 326 — \$140,852.56 reappropriated for Erie canal enlargement.
 Chapter 346 — Sec. 142, Superintendent of State salt springs may take water from canal at Montezuma for specified purposes.
 Chapter 376 — Canal auditor to act on claims when canal commissioners are disqualified.
 Chapter 437 — Concerning annual report of State Engineer.
 Chapter 495 — "Test Boats," heavily laden, to ascertain obstructions, to be run monthly on the canals.
 Governor E. D. Morgan urges speedy completion of enlargement of canal, estimating cost at \$12,100,000.
 Resident Engineer W. B. Taylor recommends canal commissioners to fix a definite date for canal closing each year.
 Superstructure, lower Mohawk aqueduct, 1,300 ft. long, entirely rebuilt; cost \$40,272.10.
 June 20 and July 12. — Breaks at Bushnell's basin; navigation delayed 5 and 10 days, respectively.
 September 28, — By the falling of an iron bridge at Albion 14 persons were either killed or drowned.
 October 7, — Break at Palmyra; navigation delayed 8 days.
- 1860 Chapter 86 — Repeals certain sections of chapter 105—1857, an act enlarging powers of contracting board.
 Chapter 119 — Iron bridge to be built at Vleet St., Cohoes. (Completed 1862.)
 Chapter 213 — Bevels in enlarged locks to be cut off and all bridges to be raised to 12 ft. clearance; \$781,000 appropriated for enlargement.
 November 29, — 50,000 cubic yards of embankment, slope walls and part of culvert swept away near Lockport.
- 1861 Chapter 92 — Concerning "Inland Navigation Insurance Companies."
 Chapter 124 — Regulating canal navigation and collection of tolls.
 Chapter 165 — Damages caused by construction Schoharie creek aqueduct to be paid.
 Chapter 177 — Canal auditor to make annual report to Legislature instead of to canal commissioners.
 Chapter 275 — Damages caused by construction Limestone creek feeder to be paid.
 Chapter 332 — Repeals part of section 3, chapter 213—1860, relating to division and resident engineers.
 Seventeen reservoirs complete or to be completed with a capacity of 5,822,-663,000 cu. ft., form part of canal system.
 State Engineer estimates cost of completion of enlargement State canals, \$390,000.
- 1862 Chapter 9 — "An act to facilitate the construction of a portion of the Erie canal enlargement."
 Chapter 35 — To abate the nuisance caused by the old, abandoned canal at Clyde.
 Chapter 91 — Squire Whipple to be paid for the use of his patent iron truss bridges on the canals.
 Chapter 137 — Reappropriation \$100,000 for completion Erie canal, also \$47,-260.44 premiums on loans for canal enlargement under Constitution.

- 1862 Chapter 169 — Enlargement declared completed September 1; canal 350½ miles; 70 ft. surface; 52½ or 56 ft. bottom; 7 ft. water; 72 locks, 110x18 ft.; 57 double and 15 single; all double, Troy to Fort Byron.
 Chapter 354 — Penalties for fast driving on canal and canal feeder bridges.
 Chapter 415 — "Gunboat locks"; an act to adapt the canals of this State for defence of northern and northwestern lakes.
 April 22, — Concurrent resolution; Governor to invite attention of Congress to chapter 415.
 De Ruyter reservoir brought into use, though not completed.
 May 6, — Governor appoints S. B. Ruggles to lay the subject before Congress.
 May 9, — Mr. Ruggles accepts and renders frequent reports thereafter.
 Schoharie creek stone dam completed.
 850 boats registered, greatest in any one year.
- 1863 Chapter 40 — Canal board to accept conveyance, Clark and Skinner canal, Buffalo.
 Chapter 72 — Nine Mile creek feeder to be made navigable.
 Chapter 131 — Canal board to complete De Ruyter reservoir.
 Chapter 297 — Amends chapter 296-1858, concerning bridge at White St., Cohoes.
 Chapter 311 — Surveys to be made for gunboat locks, 225x26 ft..
 Chapter 335 — Appropriation for improvement Oak Orchard creek and canal feeder.
 Chapter 343 — Bridge to be built at Amherst.
 Chapter 347 — Bridge to be built at Higginsville.
 Chapter 411 — Bridges to be built over side-cuts, West Troy.
 Chapter 473 — Bridge to be built at Griffith St., Rochester. (Completed 1865.)
 July 21, — Unprecedented freshet causes great damage to canal at Van Evra's, Fort Plain, Canajoharie and Schoharie creek feeder.
 De Ruyter reservoir completed, cost \$126,026.82.
- 1864 Chapter 354 — \$75,000 appropriated for two stone side-cut locks to be built at Union St., West Troy.
 Chapter 355 — Lock No. 2 to be rebuilt.
 Chapter 429 — Leakage of canal at Lockport to be checked.
 Chapter 469 — For improvement Clark and Skinner canal, Buffalo.
 Auburn St. bridge, West Troy, replaced by steel bridge.
 Timber dam built over Schoharie creek at Fort Hunter.
 Improvement of old feeder at Little Falls, completed.
 Stone dam over Schoharie creek replaced by tree-dam.
 Stone dam built over Mohawk river at Rexford Flats.
 May 11, — Break at Whitesboro, caused by muskrats; navigation delayed 5 days.
 Dam at Rochester completed.
- 1865 Chapter 270 — \$394,000 appropriated for repairing breaks and restoring navigation on the canals.
 Chapter 391 — Bridge to be built at Grape St., Syracuse. (Built 1867.)
 Chapter 429 — Amends chapter 297-1863, concerning bridge at White St., Cohoes.
 Chapter 477 — Three division and three resident engineers to be appointed.
 Chapter 675 — Bridge to be built over Clark and Skinner canal, Buffalo.
 Chapter 682 — Swing-bridge to be built over Black Rock harbor.
 Chapter 727 — Encroachments on canal lands to be removed.
 March 16, 17, 18, most disastrous flood ever known in Oswego, Seneca, Chemung, Chenango and Genesee valleys; badly damages the canals; damages aggregate over \$100,000.
 May 4, — One span upper Mohawk aqueduct gives out; navigation delayed 4 days.
 New iron Whipple bridge over canal at Ferry St., Albany, completed.
 Schoharie creek dam completed.
 George Heath's "Tumble-gate," a device for expediting lockage, first introduced, lock No. 39.

- 1866 Chapter 503 — Albany basin to be narrowed.
Chapter 543 — Maps of canal to be completed.
Chapter 584 — Iron bridge to be built over Main and Hamburg canal, Buffalo.
Chapter 618 — Bridge to be built at Illion.
Chapter 639 — Dam over Genesee river at Rochester to be altered.
Chapter 657 — Exceptions to chapter 727-1865, concerning encroachments on canal lands.
Chapter 719 — Erie basin, Main and Hamburg canal and Black Rock harbor to be improved.
Chapter 731 — Swing-bridge to be built at Fayetteville.
Chapter 748 — "Amsden's hydrostatic scales" for weighing canal-boats and cargoes to be introduced.
Chapter 807 — Wooden bridge at Columbia St., Cohoes, to be replaced by one of iron. (Rebuilt of wood, 1866.)
Chapter 841 — Amends chapter 391-1865, concerning bridge at Grape St., Syracuse.
Chapter 877 — State ditch at Port Byron to be opened.
February 16, 17, — Concurrent resolution urging Congress to build ship canal from Portage lake to Lake Superior.
June 15, — Break 5 miles west of Schenectady; 300 ft. towing-path bank swept into Mohawk river; cost of repairs, \$20,000; navigation suspended 9 days.
October 2, — Canal board resolves that in future all road and street bridges shall be rebuilt of iron.
1,818 bridges on canals, iron 187, wood 1,131; length of iron, 2½ miles; wood, 13½ miles; total, 16½ miles.
- 1867 Chapter 238 — Amends chapter 503-1866 and requires consent of two-thirds of lot owners to narrow Albany basin.
Chapter 302 — Bridge to be built at Perry St., Brockport.
Chapter 577 — Enlarges powers of contracting board.
Chapter 577, Sec. 12 — Abolished office superintendent of canal repairs.
Chapter 579 — \$100,000 appropriated for rebuilding certain wooden bridges of iron; \$50,000 for rebuilding State dam, Cohoes, of stone; \$100,000 for two locks, West Troy.
Chapter 621 — Tolls to be collected on Mohawk basin, West Troy.
Chapter 651 — Bridge to be built at Parker St., Fairport.
Chapter 844 — Iron bridge to be built over State ditch at Jack's reef. (Completed.)
Chapter 856 — Eight hours to constitute a day's work.
May 2, — West pier Crane brook aqueduct carried away in consequence of heavy rains.
Iron truss bridge over canal at White St., Cohoes, completed; cost \$24,000, most expensive bridge on the canal to date.
Albany basin improved, 100,000 cubic yards of earth dredged from the same.
Oak Orchard creek deepened through rock.
Stone dam, Rexford Flats, completed.
- 1868 Chapter 342 — Rochester to be compensated for damages caused by flood of March, 1865.
Chapter 346 — \$53,549.33 appropriated for the removal of wall benches, eastern division.
Chapter 374 — United States to remove a portion "Erie Basin Breakwater," Buffalo harbor.
Chapter 416 — Bridges to be built at Washington and George Sts., Rome.
Chapter 417 — Bridge to be built at Forman St., Cazenovia.
Chapter 422 — Bridge to be built from Irelands Corners road to Island Park, Watervliet. (Repealed chapter 877-1869.)
Chapter 518 — Bridge to be built at Exchange St., Rochester.
Chapter 579 — Appeals from decisions of canal appraisers to be taken to canal board.
Chapter 672 — De Ruyter reservoir to be improved.
Chapter 681 — Swing-bridge to be built at Rexford Flats.

- 1868 Chapter 715 — \$85,000 for rebuilding lock No. 2 and walls near same; \$60,000 for reservoir, Jordan level, and changing bridges; \$20,000 completing Clark and Skinner canal.
 Chapter 715 — Bridge to be built at Port Jackson. (Completed 1869.)
 Chapter 880 — For removal of backwater from dam at Tonawanda.
- 1869 Chapter 32 — Canal commissioners and State Engineer to repair Albany basin and lock opening into same.
 Chapter 100 — For constructing vertical wood docking, berme bank at Rome.
 Chapter 281 — For constructing vertical stone wall, berme bank at Macedon.
 Chapter 693 — \$15,000 for walls at Utica.
 Chapter 877 — \$200,000 for doubling locks, western division; \$100,000 re-appropriated for locks at West Troy; \$100,000 for constructing Fish creek feeder; \$40,000 for deepening canal near Rochester; \$40,000 for deepening near Limestone feeder; \$15,000 for completing Main and Hamburg St. canal; \$15,000 for Otisco lake reservoir; \$15,000 for widening lock No. 39; \$15,000 for reservoir, Jordan level.
 State Engineer recommends three steam dredges for use on the canal.
 September 21. — Break in towing-path, Pool's brook; 2,200 cubic yards of earth carried out; navigation delayed 7 days.
 October 4-11. — Worst floods ever known on the canals; on the 4th and 5th, five and one-half inches of rain fell; damages immense; navigation suspended for weeks.
 November 7. Death of Oliver Bascom, canal commissioner in charge of eastern division.
 Lock No. 49 widened, cost \$14,873.40.
- 1870 Chapter 55 -- Contracting board and contract repair system abolished.
 Chapter 222 — Canal officials authorized to destroy boats and all objects impeding navigation.
 Chapter 299 — The wilful destruction of a canal-boat declared a felony.
 Chapter 385 — Eight hours to constitute a day's work for laborers and mechanics in State or municipal employ.
 Chapter 576 — Cable towing system to be tried.
 Chapter 655 — Providing for the introduction of an improved system of steam towage upon the canals.
 Chapter 767 — Authorizing a tax of one mill per dollar for canal improvement.
 Chapter 767 — Hughes' patent steam canal dredge to be tested.
 March 18. — Report of special committee on cases of surplus water.
 River dock wall below upper side-cut, West Troy, raised ten feet and laid in cement.
 April. — Canal board, pursuant to resolution of Legislature, reduces canal toll rates 50 per cent.
 Lock No. 49 widened to 20 feet.
 November 17. — Steam as a motor power first successfully used. Canal-boat George G. Barnard, steam-propelled, steams up the river, through canal to Schenectady and return.
- 1871 Chapter 348 — For a swing-bridge over the canal at Buffalo St., Rochester.
 Chapter 602 — Utica, Chenango and Susquehanna Valley R. R. Co. to build a bridge at lock No. 46.
 Chapter 778 — Locks Nos. 47 and 48 to be widened.
 Chapter 868 — Steam, caloric, electricity or any motor power other than animal power to be introduced, \$100,000 in prizes offered.
 Chapter 911 — The American system of cable towage to be introduced.
 Chapter 930 — Appropriates \$20,000 for purposes specified in chapter 348.
 Chapter 943 — Tonawanda dam to be cut down two feet.
 February 14. — Canal board adopted resolutions requesting legislative investigation of canal management and finances.
 February 16. — Canal board, in response to Assembly inquiry of the 6th inst., report against enlarging locks on western division.
 April 28. — Bad break at Ox Bow bend near Fairport; navigation delayed ten days.

- 1871 September 5, — Construction of a crib ordered between canal and Black Rock harbor, 120 feet from the bank.
November, — Exhibition of "Belgian System," endless cable propulsion of canal-boats, given between Albany and West Troy.
The A. H. Dawson, the first steamer plying the canal.
Heath's patent "tumble-gates," placed in some of the locks, give general satisfaction.
November, — Canals suddenly closed by extreme cold; 800 boats laden with merchandise frozen in.
Oriskany creek feeder completed.
- 1872 Chapter 550 — Williamson to try road steam-engine towing on course of five miles of canal.
Chapter 583 — Dam at Owasco lake to be raised three feet.
Chapter 652 — Swing-bridge to be built at Hotel St., Utica.
Chapter 653 — Swing-bridge to be constructed at Buffalo St., Rochester.
Lock No. 2 doubled. Locks Nos. 47 and 48 widened and fitted with Heath's "tumble-gates."
Otisco lake reservoir completed, capacity 784,000,000 cu. ft.
1,000 lineal feet vertical wall constructed east of guard-lock, Utica.
Under provisions of chapter 343-1872, the canal commissioners begin construction of the Jamesville reservoir.
Twelve steamers competed for the prize offered by chapter 868-1871; no award.
- 1873 Chapter 480 — Amending chapter 868-1871, concerning the introduction of some propulsive power for canal-boats other than animal power.
Chapter 766 — Reappropriation of fund by chapter 930-1871, for a swing-bridge at Buffalo St., Rochester.
Chapter 766 — Whipple lift-bridge to be built at Hotel St., Utica.
The trunk of Schoharie creek aqueduct newly built; cost \$44,070.12.
Lock No. 72 and Newark locks, Nos. 57, 58 and 59, doubled.
April, — Canals of the middle division swept by a devastating flood.
Feeder dam at Port Byron carried away.
Six steamers competed for prizes under chapter 868-1871; no award.
- 1874 Chapter 399 — Tonawanda side-cut lock to be built.
Chapter 399 — Appropriation, \$360,000, for removing bench walls and substituting slope wall on canal.
Chapter 399 — For a bridge over the canal at Emerson, town of Gates.
Chapter 399 — For an iron bridge over the canal at Austin St., Buffalo.
Chapter 618 — Prizes, under chapter 868-1871, steam on canals: \$35,000 to William Baxter; \$15,000 to D. B. Dobbins; \$5,000 to T. D. Davis.
November 3, — Art. 7, Sec. 6 of Constitution prohibiting the sale of Erie, Oswego, Champlain, Cayuga and Seneca canals adopted.
November 23, — Terrible storm wrecks Erie basin breakwater.
Jamesville reservoir completed; cost \$130,000.
New dam to be constructed of stone at Owasco outlet, Auburn.
Amount of canal expenditures limited to the amount of canal revenues the previous year, Art. VII, Sec. 6, Constitution.
Canal maps completed.
Fifteen steamers on the canals.
- 1875 Chapter 48 — Amending chapter 399-1874, provides for a draw-bridge at Otsego St., town of German Flats.
Chapter 260 — Expense of maintaining lateral canals not to exceed double the amount of tolls received on each for the preceding year.
Chapter 499 — Canal board to report as to sale of lateral canals.
Lock at Lyons doubled, thus completing work of doubling locks from Albany to Buffalo.
Iron swing-bridge over canal at Buffalo St., Rochester, completed pursuant to chapter 348-1871.
December, — Stone dam at Owasco, Auburn, completed, pursuant to chapter 399-1874.

- 1875 Iron turn-table bridge over canal at Salina St., Syracuse, constructed pursuant to chapter 381-1871.
 March 19, — Special message of the Governor on canals; recommends legislative inquiry.
 May, — Report of legislative committee on canal matters.
 Navigable season shortest on record. Opened May 18, closed on account of snow and ice November 24,—191 days.
- 1876 Chapter 385 — Appointment and removal of engineers vested in State Engineer.
 Chapter 387 — An act to encourage improvement in steam propulsion of canal-boats.
 Chapter 388 — Canal board given power to investigate all matters pertaining to the State canals.
 Chapter 425, Sec. 6, — State Engineer to cause survey to be made to ascertain condition of canal and requisite improvements.
 Chapter 425 — All appropriations for work, new or extraordinary, except on Champlain and Oneida Lake canals, repealed.
 Chapter 425, Sec. 5, — Canal to be made seven feet deep, where less.
 Constitution, Art. V, Sec. 3, — Office of canal commissioner abolished and its powers vested in Superintendent of Public Works.
 March 24, — Special message of Governor recommending appropriation \$400,000 to deepen canal to full seven feet.
 Erie breakwater repaired. Wrecked November, 1874.
 New trunk inserted in Oriskany creek aqueduct.
 Surveys under chapter 425-1876 completed.
 December, — Stone dam at Auburn completed pursuant to chapter 399-1874.
- 1877 Chapter 365 — Rochester may build a swing-bridge over the canal at Allen St.
 Chapter 366 — An act for the introduction of the Stevenson system of towage on the Erie canal.
 Chapter 369 — Canal board to close the Genesee feeder, if not inimical to canal and State interests.
 Chapter 371 — Experiments with Baker's single rail system of steam towage to be made.
 Chapter 404 — For the sale of certain lateral canals with their appurtenances. Experiments made with "Dynamometer" to determine the force required to move boats at various speeds.
 State Engineer reports that Genesee feeder cannot be closed.
 Division wall in Black Rock harbor, 10,455 ft., completed, 897 ft. to be built.
 Frick's patented plan of "double headers," one boat coupled behind the other, introduced.
- 1878 Nineteen steam canal-boats on the canals.
 "Seymour plan" of canal enlargement enunciated.
- 1879 Chapter 88 — For construction of an iron swing-bridge at Lawrence St., Albany.
 Chapter 152 — Superintendent of Public Works to make permanent appropriations of land for canal repairs.
 Chapter 398 — For construction of a hoist-bridge over canal at Fort Plain.
 Chapter 403 — Made a misdemeanor for any canal employee to receive a gratuity for doing or omitting to do his duty.
 Chapter 539 — Cooke's system of towing by traction, or floating locomotives, from or upon a submerged railway to be tested.
- 1880 Chapter 97 — For the construction of a bridge over canal at York St., Buffalo. (Completed same year.)
 Chapter 99 — State Engineer to make all plans for canal improvements.
 Chapter 359 — Superintendent of Public Works to keep Genesee river feeder in good condition.
 Chapter 424 — For a swing-bridge over canal at Main St., Brockport. (Completed 1888.)

- 1880 Chapter 462 — For a bridge over canal at Kent St., Palmyra. (Built 1882.) Cable towing tried between Utica and Syracuse, but abandoned. 76,000 cubic yards of sediment removed from the prism of the canal. April 22, — Break near Utica; several thousand yards of canal bottom carried out; navigation delayed 7 days. 1,169 bridges on the canal maintained at State expense and of no use to navigation.
- 1881 Chapter 38 — Authorizing the City of Buffalo to lay a sewer in the towing-path. Chapter 340 — Swing-bridge to be built at Main St., Brockport. (Completed 1888.) Chapter 536 — All iron bridges over canals shall be on specifications of State Engineer and let to contract. Chapter 569 — Powers of contracting board conferred on Superintendent of Public Works.
- 1882 Chapter 21 — Appropriation for removing obstructions from canal. Chapter 91 — Amends chapter 21, and provides fund shall be paid on Comptroller's warrant, instead of Superintendent of Public Works. November 7, — Constitutional amendment ratified by the people; Art. VII, Sec. 3, no tolls to be imposed on the canals; Sec. 5, canal debt to be raised by taxation; Sec. 6, Erie, Champlain, Oswego, Cayuga and Seneca, and Black River canals never to be leased or sold. 876,000 cubic yards of sediment dredged from canals and basins during the spring. Turbines, devised by Dennison Richmond, used in locks for hauling boats, prove of great utility. Auditor's financial report shows that canal revenues have exceeded in amount the cost of canal construction by \$8,333,457.18. Cost of Erie, Oswego and Champlain canals to date, \$102,345,123; tolls collected, \$134,648,900; balance in favor of canals, \$32,303,777. Ninety-two steamers on the canals.
- 1883 Chapter 10 — Syracuse may substitute a swing-bridge in place of the elevated bridge over canal at Warren St. Chapter 69 — Office of auditor of canal department abolished and his powers conferred on Comptroller. Chapter 165 — Office of weighmaster and collector abolished. Chapter 205 — Office of canal appraiser abolished. Chapter 448 — Old Navigation Company's lock at Little Falls to be preserved. Chapter 495 — Appropriation canal fund for Albany basin. January 1, — Provision abolishing tolls becomes effective. Traffic immensely augmented since tolls were abolished; grain moved from Buffalo 42,850,916 bushels; gain over season of 1882 of nearly 13,000,000 bushels. Ninety-two steamers on the canals.
- 1884 Chapter 80 — Lock No. 50 to be lengthened to pass "double headers"; the first lock to be so treated. Chapter 168 — Little Falls to be repaid for abating nuisance on abandoned canal. Chapter 294 — Surplus water of Rome level not to be discharged into Butter-nut or Limestone creeks. Chapter 362 — Ice on canals may be cut by citizens for their own use. Chapter 364 — For the construction of an iron bridge over canal at Prospect St., Medina. April 1, — Report of Superintendent of Public Works concerning encroachments.
- 1885 Chapter 77 — Erie canal at Buffalo from Jersey St. to Hudson St. to be protected from lake encroachments. Chapter 119 — Sewer to be laid under the canal at Utica.

- 1885 Chapter 205 — For completion of an iron bridge over canal at Catherine St., Syracuse. (Completed 1886.)
 Chapter 246 — Suspension bridge over canal at North Erie St., Albany, to be rebuilt.
 Chapter 279 — Iron bridge to be built over the canal at Herkimer.
 Chapter 312 — Old canal at Rome to be drained.
 Lengthening lock No. 50 to 220 feet completed.
 Buffalo trunk sewer completed.
- 1886 Chapter 32 — For construction of iron bridge over canal at Main St., Lockport. (Completed same year.)
 Chapter 396 — The Lyell and Saxton St. sewer under the canal at Rochester to be enlarged.
 Chapter 552 — Obstructions to canal at Ments and Montezuma to be removed.
 Chapter 553 — Bridge over canal at Monroe Ave., Rochester, to be enlarged and rebuilt. (Completed 1887.)
 Chapter 646 — Appropriation for increasing lockage capacity of the canal.
- 1887 Chapter 59 — Bridge to be built over the canal at Hudson St., Buffalo. (Built 1888.)
 Chapter 113 — Appropriation for increasing the lockage capacity of the canal.
 Chapter 118 — Reappropriation for swing-bridge at Brockport. (Built 1888.)
 Chapter 150 — For an iron arch-bridge at Cottage St., Lockport. (Built 1888.)
 Chapter 233 — Lift-bridge to be built at West St., Syracuse. (Built 1888.)
 Chapter 274 — Lift-bridge to be built at John St., Utica. (Built 1888.)
 Chapter 311 — Lift-bridge to be built at Main St., Fort Plain. (Built 1888.)
 Chapter 338 — Appropriation for draining abandoned canal at Rome.
 Chapter 402 — Lift-bridge to be built at Glasgow St., Clyde. (Built 1888.)
 Chapter 528 — Registry of canal-boats transferred from Comptroller to Superintendent of Public Works.
 Chapter 585 — Rebuilding and enlargement of Main St. bridge, Tonawanda. (Completed 1888.)
 Chapter 587 — Bridge to be built at Austin St., Buffalo. (Built 1888.)
 Chapter 612 — Iron bridge to be built at Parker St., Fairport.
 Chapter 643 — Leakage and overflow of the canal at Rochester to be carried off by use of Rowe St. sewer.
 Locks Nos. 47, 48, 49, 51 and 52 lengthened.
- 1888 Chapter 351 — Lift-bridge to be built at West Main St., Rochester. (Built 1889.)
 Chapter 400 — Lift-bridge to be built at Ferry St., Albany. (Built 1889.)
 Chapter 416 — Appropriation for increasing lockage capacity of canal.
 Chapter 417 — Lift-bridge to be built at Schuyler St., Utica.
 Chapter 546 — Lift-bridge to be built at Geneva St., Lyons.
 Locks Nos. 31, 32, 33, 34, 35, 44, 45, 53, 54, 55, 56, 60, 61, 62 and 72 lengthened.
 The lengthening of lock No. 46 interrupted by an injunction obtained by Delaware, Lackawanna and Western Railroad Co.
 85 new boats, with a total tonnage of 18,753 tons, registered during the year.
 July 8, — A bad break occurred at Adam's basin interrupting navigation 12 days.
 October 4, — Death of Dennison Richmond, division engineer, middle division, one of the oldest and best, as to service, engaged in the work.
- 1889 Chapter 51 — For the construction of an iron bridge over canal at Liberty St., Schenectady. (Built 1890.)
 Chapter 54 — Appropriation for increasing lockage capacity of the canal.
 Chapters 70 and 493 — Appropriations for lengthening lock No. 72.
 Chapter 84 — For the construction of an iron bridge over canal at Prospect St., Lockport.
 Chapter 100 — Lift-bridge to be built at Caledonia Ave., Rochester. (Built 1891.)

- 1889 Chapters 110, 493 and 568 — Provide for increasing the lockage capacity of the canal.
- Chapter 141 — Made a misdemeanor to sell ice cut from canals, without marking the same "canal ice."
- Chapter 149 — For the improvement of the iron bridge over canal at Main St., Fultonville.
- Chapter 213 — Appropriation for repairs to canal at Utica.
- Chapter 291 — Skaneateles lake water to be used by Syracuse, with consent of canal board.
- Chapter 321 — For the construction of an iron bridge over canal connecting Delaware St., Tonawanda, and Main St., North Tonawanda.
- Chapter 380 — Laborers in State employ to be paid not less than \$2 per day.
- Chapter 481 — For the construction of an iron bridge over canal at Culver St., Rochester. (Built 1890.)
- Chapter 557 — For the construction of an iron bridge over canal at George St., Rome.
- Locks Nos. 27, 28, 29, 30, 63 and 64 lengthened.
- Seven breaks occurred during the season, causing a total delay to navigation of 18 days.
- 1890 Chapter 168 — Six locks on Erie to be lengthened.
- Chapter 177 — Lift-bridge to be constructed over canal from Caledonia Ave., to West Main St., Rochester, pursuant to chapter 100-1889.
- Chapter 314 — City of Syracuse to take water from Skaneateles lake.
- Chapter 333 — Bridge over canal at Fultonville to be rebuilt, pursuant to chapter 149-1889.
- Chapter 338 — Reappropriation unexpended balance for lift-bridge over canal at Schuyler St., Utica, pursuant to chapter 417-1888.
- Chapter 338 — Reappropriation unexpended balance for lift-bridge over canal at Geneva St., Lyons, pursuant to chapter 546-1888.
- Chapter 338 — Appropriation for lengthening locks on the canal.
- Chapter 385 — Sanitary condition of old abandoned canal at Rome to be improved.
- May 25, — Bad break near Whitesboro, 300 feet canal bottom and 70 feet tow-path washed away; navigation delayed 10 days.
- February 9, — Death of Thomas Evershed, division engineer, western division.
- Locks Nos. 23, 24, 25, 26, 65 and 66 lengthened.
- Twenty-four miles of canal bottomed out.
- 1891 Chapter 69 — Amending chapter 417-1888, provides for a swing-bridge at Schuyler St., Utica. (Completed 1892.)
- Chapter 77 — For a hoist-bridge at Church St., Schenectady.
- Chapter 82 — Additional appropriation for an iron bridge at Main St., North Tonawanda, pursuant to chapter 321-1889. (Completed 1892.)
- Chapter 113 — Moyer creek to be improved.
- Chapter 138 — For a lift-bridge at Rowe St., Rochester. (Built 1892.)
- Chapter 239 — For a bridge at 19th St., West Troy. (Built 1892.)
- Chapter 341 — Authorizing Utica to build bridges over canal at Genesee St. (Built 1892.)
- Chapter 346 — Penalties for persons driving animals on the tow-path of canals.
- Chapter 366 — State not to build street bridges over canal unless street was used as a highway prior to construction of canal.
- Steamer Carrie Stewart, with five consorts, pushing one and towing two "double-headers," makes trip from New York to Buffalo and return.
- February 18, — Senate resolution requires State Engineer to report concerning bridges constructed on roads not opened when canal was built.
- March 2, — Report of State Engineer in pursuance of above resolution.
- April 28, — A committee of seven Assemblymen appointed under resolution to investigate canal management during past eleven years.
- July 22, — Flat Stone creek aqueduct suddenly collapses; trunk, stone piers, masonry arches demolished; navigation suspended eleven days.

- 1891** Merchants' Exchange, Buffalo, petition Superintendent of Public Works to extend season of navigation to lessen railroad freight rates; time extended five days.
 Thirty-eight locks have been lengthened since 1884, at an average cost of \$22,000.
 Twenty-nine steamers in active service on the Erie canal.
 Locks Nos. 40, 41, 42, 43 and 46 lengthened.
- 1892** Chapter 253 — Part of canal bank beside abandoned canal at Fairport to be removed.
 Chapter 382 — Reappropriation unexpended balances for improvement of canal.
 Chapter 394 — For a lift-bridge over canal at Water St., Albany; property benefited to bear the expense.
 Chapter 476 — Obstruction in canal at Buffalo to be removed.
 Chapter 480 — Appropriation for construction of a stone dam over Mohawk river at Little Falls.
 Chapter 601 — For an iron bridge over canal at South Madison St., Rome. (Completed 1894.)
 Chapter 610 — For a swing-bridge over canal, connecting Mulberry and Lock Sts., Syracuse. (Completed 1894.)
 Chapter 612 — For improving sanitation of old abandoned canal at Rome.
 February 17, — Assembly resolution requiring a report from Superintendent of Public Works as to what appropriation should be made for bridge construction.
 March 3, — Report of Superintendent of Public Works in response to foregoing resolution submitted.
 February 24, — Assembly committee appointed on April 28, 1891, report that charges of canal mismanagement are not sustained by the evidence.
- 1893** Chapter 5 — Appropriation for repairing the upper and lower Mohawk and Schoharie creek aqueducts.
 Chapter 14 — For a wrought-iron bridge over canal at Ford St., Rochester. (Completed 1894.)
 Chapter 57 — For a hoist-bridge over canal at Clinton St., Syracuse. (Completed 1894.)
 Chapter 94 — Bridge at Mulberry St., Syracuse, to be removed and erected over canal at Nichols St., town of DeWitt.
 Chapter 119 — For completing State dam and repairing the feeder at Little Falls.
 Chapter 119, Sec. 4 — State Engineer to make experiments with electricity as a motor power on canals.
 Chapter 136 — For improving Oak Orchard creek and canal feeder.
 Chapter 137 — For a foot-bridge over canal at 15th St., West Troy.
 Chapter 153 — For construction of wrought-iron bridges over canals at Canal, Prime, Scott and Perry Sts., Buffalo.
 Chapter 161 — Approaches to bridge over canal at Brutus to be lengthened and enlarged.
 Chapter 197 — For a wrought-iron bridge over canal at Ann St., Little Falls.
 Chapter 336 — For a swing or hoist-bridge at Emerson St., Rochester, the city to bear part of expense.
 Chapter 420 — Amending chapter 253-1892, provides for filling up abandoned canal between the south bank of new canal and the westerly part of Fairport.
 Chapter 560 — Amending chapter 341-1891, for an iron bridge and a lift-bridge at Genesee St., Utica.
 Chapter 561 — For a wrought-iron bridge over canal at Bridge St., Amsterdam.
 Chapter 562 — For an iron bridge over the abandoned canal at South James St., Rome. (Completed 1894.)
 Chapter 567 — Commission appointed to report methods for improving Albany basin.
 November 18, — Electricity by trolley, as a power for canal-boats, first experimentally used on canal near Rochester.

- 1894 Chapter 24 — For strengthening canal embankment, Schenectady.
 Chapter 84 — Additional appropriation for improving upper and lower Mohawk and Schoharie creek aqueducts.
 Chapter 385 — For a hoist-bridge over canal at Geddes St., Syracuse. (Completed 1895.)
 Chapter 423 — For building vertical wall from Gilbert St. to Turner St., Utica.
 Chapter 496 — Reappropriations for completing Black river reservoir, Forestport, and canal improvements.
 Chapter 559 — For a wrought-iron bridge over canal at Griffith St., Rochester.
 Chapter 560 — Additional appropriation for a swing-bridge over canal at Emerson St., Rochester, pursuant to chapter 336-1893. (Completed 1896.)
 Chapter 571 — For rebuilding Schoharie creek dam.
 Chapter 572 — For increasing the lockage capacity and improvement of the canal.
 Chapter 573 — For a lift-bridge over canal at Adam St., Lockport, the city to bear a part of the expense.
 Chapter 576 — For a three-truss, wrought-iron, double-roadway bridge over canal at Main St., Fairport.
 Chapter 588 — For increasing the depth of water in the Erie basin, Buffalo.
 Chapter 592 — For a hoist-bridge over canal at Canajoharie.
 Chapter 652 — State Engineer to prepare plans for a complete overhauling of West Main St. lift-bridge, Rochester.
 Chapter 653 — For repairing and extending retaining wall, Saint Paul St., Rochester.
 Forestport reservoir completed; begun in 1884.
 Recommendations of Constitutional Convention concerning canal improvements ratified by a majority of 115,353 votes.
 Art. VII, Sec. 6, of State Constitution amended, permitting sale of Main and Hamburg canal.
 Lock No. 19 lengthened.
- 1895 Chapter 18 — For a wrought-iron bridge over canal at Mill St., Buffalo. (Completed 1896.)
 Chapter 67 — For construction of a waste-weir and spillway near lock No. 41.
 Chapter 79 — "Nine million-dollar act." People to decide whether such sum shall be spent in improving Erie, Champlain and Oswego canals.
 Chapter 89 — Provision for State's share of construction expenses of hoist-bridge, Clinton St., Syracuse.
 Chapter 99 — For improvements at Owasco lake.
 Chapter 139 — For a bridge over canal at Main Ave., Cohoes.
 Chapter 141 — For a bridge over canal at High St., Cohoes.
 Chapter 151 — For completion of a bridge over canal at Main St., Fairport, pursuant to chapter 576-1894. (Completed 1896.)
 Chapter 170 — Public Works Department to make alterations of the bridges and to change machinery for operating same at Genesee St., Utica.
 Chapter 217 — For an iron bridge over canal at Main St., Newark. (Completed 1896.)
 Chapter 219 — Reappropriation for experiments with electricity as a motor power on canals, pursuant to chapter 119-1893.
 Chapter 219 — Reappropriation for Emerson St. bridge, Rochester, pursuant to chapter 336-1893.
 Chapter 219 — Reappropriation for bridge at DeWitt, pursuant to chapter 94-1893.
 Chapter 224 — For deepening and improving the Erie basin, Buffalo.
 Chapter 288 — For repairs and improvements to canal wall, berme side, Schenectady.
 Chapter 299 — For construction of vertical wall, berme side, Higginsville.
 Chapter 311 — For a hoist-bridge over canal at Genesee St., Syracuse, city to bear one-half the expense.
 Chapter 320 — For improving locks Nos. 21 and 22 at Clifton Park.
 Chapter 367 — For vertical wall, berme side, between Clay and Hubbell Sts., Utica.

- 1895 Chapter 476 — For strengthening canal embankment at Gasport.
 Chapter 492 — For improvements to State St. bridge, Schenectady.
 Chapter 514 — For a bridge over canal at Exchange St., Rochester. (Completed 1896.)
 Chapter 560 — For repairs to canal dam at Rexford Flats.
 Chapter 590 — For a bridge over canal at Porter Ave., Buffalo.
 Chapter 680 — For a wrought-iron or steel bridge over canal at German St., Little Falls. (Completed 1898.)
 Chapter 968 — For completing vertical wall, berme side, at Gilbert St., Utica.
 Chapter 969 — For repairing culvert at Sullivan.
 November 5, — People ratify provisions of chapter 79-1895 by a majority of 276,886 votes.
 Successful experiments made with Lamb's system electrical towing of canal boats at Tonawanda.
 April 11, — Death of John Bisgood, division engineer, western division; aged 72 years, 42 of which were spent in canal service.
 June 5, — Break near Pattersonville, delays navigation eight days.
 Telephone line connecting Forestport and North Lake built by Superintendent of Public Works for canal purposes.
- 1896 Chapter 188 — Creates the office of Deputy Superintendent of Public Works.
 Chapter 292 — For improving sanitary condition of bed of old Erie canal at Minden.
 Chapter 482 — Reappropriation for Adam St. bridge, Lockport, pursuant to chapter 573-1894.
 Chapter 482 — Reappropriation for hoist-bridge at Canajoharie, pursuant to chapter 592-1894.
 Chapter 482 — Reappropriation for bridge over canal at Porter Ave., Buffalo, pursuant to chapter 668-1894. (Completed 1897.)
 Chapter 492 — Amending section 75 of article V, chapter 338-1894, gives Superintendent of Public Works power to remove encroachments from canal lands.
 Chapter 521 — To provide for placing buoys in Erie basin, Buffalo.
 Chapter 761 — For a bridge over Oak Orchard creek feeder at Shelby St., Medina.
 Chapter 794 — Amending chapter 79-1895, regulates the making of contracts for work on the canal.
 Chapter 881 — Regulates the use of floating elevators on the canals.
 Chapter 947 — Appropriates \$50,000 for electric communication between canal stations.
 Chapter 947 — Appropriates \$125,000 for improvements to each of the three divisions of State canals.
 Chapter 949 — Reappropriation for improving Rocky rift feeder, pursuant to chapter 932-1895.
 Chapter 950 — For deficit in expense of lengthening lock No. 20.
 Chapter 950 — For repairs to State dyke, Amsterdam.
 Chapter 950 — For completing State ditch, town of Elbridge, Onondaga County.
 Chapter 950 — Covering deficit in matter of Emerson St. bridge, Rochester, pursuant to chapters 336-1893 and 560-1894.
 Chapter 950 — Supplementing chapter 311-1895, provides for completion of a hoist-bridge over canal at West Genesee St., Syracuse.
 Chapter 950 — Supplementing chapter 175-1895, provides for installation of electric apparatus for operating Genesee St. lift-bridges at Utica.
 January 13, — Work on surveys begun for canal improvements under chapter 79-1895.
 March 30, — High water and floating ice from Tonawanda creek carries out spillway of dam near Pendleton.
 Construction work begun for deepening to 9 ft.
- 1897 Chapter 32 — For a bridge over canal at Fitzhugh St., Rochester. (Completed May 10, 1899.)
 Chapter 43 — Unexpended balance of chapter 79-1895 reappropriated for improvement of canals.

- 1897 Chapter 105 — For a hoist-bridge over canal at Railroad St., Ilion. (Completed 1898.)
 Chapter 207 — For a new steel bridge over canal at Monroe Ave., Rochester.
 Chapter 339 — For a bridge over canal at South Clinton St., Rochester. (Completed May 31, 1899.)
 Chapter 562 — Additional appropriation to that of chapter 592-1894, for a lift-bridge over canal at Canajoharie.
 Chapter 563 — For a lift-bridge over canal at Whitesboro St., Utica, city to bear part of expense.
 Chapter 565 — For a lift-bridge over canal at Broad St., Utica, city to bear part of expense.
 Chapter 566 — Appropriates \$360,000 for improvement of canals.
 Chapter 568 — For a bridge over canal at Hamilton St., Buffalo.
 Chapter 569 — Appropriation for progression of the improvements of canal provided for by chapter 79-1895.
 Chapter 571 — For a swing-bridge over canal at Salina St., Syracuse, city to pay one-half the expense.
 Chapter 572 — Reappropriates unexpended balance for German St. bridge, Little Falls, pursuant to chapter 680-1895.
 Chapter 572 — Unexpended balance for Nichols St. bridge, DeWitt, provided by chapter 94-1893, reappropriated.
 Chapter 572 — Reappropriates unexpended balance provided by chapter 514-1895, for Exchange St. bridge, Rochester. (Completed 1898.)
 Chapter 572 — Reappropriates unexpended balance provided by chapter 170-1895, for Genesee St. bridges, Utica.
 Chapter 576 — For a lift-bridge, also a foot-bridge over canal at Fort Plain. (Completed 1898.)
 Chapter 790 — Appropriation for completion of bridge over canal feeder at Medina as per chapter 791-1896.
 Chapter 791 — Additional appropriation for Exchange St. bridge, Rochester, pursuant to chapter 514-1895.
 July 23, — Disastrous break in towing-path of Forestport feeder; large gangs working night and day, make repairs in 30 days.
- 1898 Chapter 15, as amended by 327 — Governor to appoint a commission to investigate affairs of canal improvement.
 Chapter 295 — Main and Hamburg canal abandoned to the City of Buffalo.
 Chapter 397 — For a lift-bridge over canal at Washington St., Utica, city to bear part of the expense.
 Chapter 424 — For a hoist-bridge over canal at Catherine and Almond Sts., Syracuse.
 Chapter 427 — For a lift-bridge over canal at Schuyler St., Utica.
 Chapter 504 — For a bridge over canal at Main St., Pittsford.
 Chapter 552 — Reappropriates unexpended balance for establishing electrical communication between canal stations, pursuant to chapter 947-1896.
 Chapter 552 — Reappropriates unexpended balance for bridge at Canajoharie, pursuant to chapter 592-1894.
 Chapter 552 — Reappropriates unexpended balance for bridge at Adam St., Lockport, pursuant to chapter 573-1894.
 Chapter 606 — For a bridge over canal at West Genesee St., Syracuse, pursuant to chapters 311-1895 and 950-1896.
 Chapter 606 — Appropriation for Porter Ave. bridge, Buffalo, pursuant to chapter 590-1895.
 Chapter 606 — Appropriation for completion of bridge over canal at Fitzhugh St., Rochester, pursuant to chapter 32-1897.
 Chapter 606 — Appropriation for completion of bridge over Oak Orchard creek feeder at Medina, pursuant to chapter 791-1896.
 Chapter 607 — Additional appropriation for completion of Monroe Ave. bridge, Rochester, pursuant to chapter 207-1897.
 Chapter 611 — For a bridge over canal at Erie St., Buffalo.
 Chapter 618 — For a lift-bridge over canal at Brighton.
 Chapter 620 — For repairs to Oriskany creek feeder, town of Kirkland.
 Chapter 625 — For a new iron bridge over canal at South George St., Rome.

- 1898 Chapter 626 — For a lift-bridge over canal at Peterboro St., Canastota.
 Chapter 630 — For a wrought-iron bridge over canal between Pendleton and Pickard's bridge, Erie and Niagara counties.
 Chapter 633 — For vertical wall on each side of Oneida feeder, at Oneida.
 Chapter 635 — For increasing depth of water in Erie basin, Buffalo, 150 feet wide and 20 feet deep.
 Bad break near lock No. 24; opening 250 feet long and 22 feet below canal bottom. Repaired in nine days.
 March 8, — Governor appoints seven prominent citizens, pursuant to chapters 15 and 327-1898.
 Work of improvement suspended; funds exhausted.
 May 23, — Bad break in towing-path of Forestport feeder—caused maliciously.
 July 30, — Investigating Commission reports.
 November 28, — Edwin Countryman, Governor's special counsel, advises submission of the Commission's report to the grand jury.
 December 2, — Superintendent of Public Works suspended from office, at his own request.
- 1899 Chapter 220 — Reappropriates unexpended balance for improvement of the canal, pursuant to chapter 569-1897.
 Chapter 280 — Amending section 37, chapter 338-1894, providing that the act compensating for damages sustained through canal construction or management shall not extend to those resulting from the navigation thereof.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at Fitzhugh St., Rochester, pursuant to chapter 32-1897.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at Monroe Ave., Rochester, pursuant to chapter 207-1897.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at South Clinton St., Rochester, pursuant to chapter 399-1897.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at Canajoharie, pursuant to chapter 562-1897.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at Broad St., Utica, pursuant to chapter 565-1897.
 Chapter 477 — Reappropriates unexpended balance for bridge over canal at Hamilton St., Buffalo, pursuant to chapter 568-1897.
 Chapter 477 — Reappropriates unexpended balance for completion of bridge over canal at Exchange St., Rochester, pursuant to chapter 791-1897.
 Chapter 519 — For the construction of pneumatic lock and canal connections in place of "sixteens" at Cohoes, at private expense. (Nothing done.)
 Chapter 544 — Authorizes canal board to terminate contracts made for improvement of major canals, pursuant to chapter 79-1895.
 Chapter 549 — For a new steel bridge over canal at West Ave., Rochester. (Completed August 1, 1902.)
 Chapter 569 — For bridge over canal at German St., Little Falls, pursuant to chapter 680-1895.
 Chapter 569 — For bridge over canal at Railroad St., Ilion, pursuant to chapter 105-1897.
 Chapter 569 — For completion of bridge over Oak Orchard creek feeder, Medina, pursuant to chapters 791-1896 and 606-1898.
 Chapter 572 — For bridge over canal at South George St., Rome, pursuant to chapter 625-1898.
 Chapter 573 — For a wrought-iron bridge over canal at Chapel St., Lockport. (Completed October, 1901.)
 Chapter 596 — For a steel bridge over canal at Minden.
 Chapter 625 — For bridge over canal at Brinard St., Whitesboro.
 January 19, — Senate resolution requests State Engineer and Superintendent of Public Works to report status of canal operations under chapter 79-1895.
 February 7, — Report called for by above resolution submitted.
 March 8, — Governor appoints commission of seven—State Engineer, Superintendent of Public Works and five prominent citizens to report best policy to be adopted in reference to canals.
 May 9, — Break in berm bank, Spencerport, destroys waste-weir 12 and culvert 47; repaired in seven days with full head of water in canal.

- 1899 September 18, — Disastrous break in tow-path, Forestport feeder, near breaks of 1897 and 1898; caused maliciously; repaired, 17 days; cost of repairing three breaks, over \$130,000.
 Navigable season, April 26 to December 1, — longest since 1882.
- 1900 Chapter 16 — Additional appropriation for bridge over canal at Chapel St., Lockport, pursuant to chapter 573-1899.
 Chapter 81 — Authorizes canal board to "terminate, settle and adjust" between the parties to all contracts made for improvement of canal, pursuant to chapter 79-1895.
 Chapter 311 — Comptroller to borrow \$350,000 for extraordinary repairs and improvements to structures and works on canals.
 Chapter 402 — Additional appropriation for hoist-bridge over canal at Washington St., Utica, pursuant to chapter 397-1898.
 Chapter 411 — Appropriates \$200,000 for surveys, estimates, etc., of canal improvements suggested by Commission of March 8, 1899. (Barge canal.)
 Chapter 417 — Reappropriates unexpended balance for installing electrical communication between canal stations, pursuant to chapters 947-1896 and 552-1898.
 Chapter 417 — Reappropriates unexpended balance for hoist-bridge over canal at Schuyler St., Utica, pursuant to chapter 427-1898.
 Chapter 417 — Reappropriates unexpended balance for bridge over canal at Main St., Pittsford, pursuant to chapter 504-1898.
 Chapter 417 — Reappropriates unexpended balance for bridge over canal at Adam St., Lockport, pursuant to chapters 573-1894 and 552-1898.
 Chapter 417 — Reappropriates unexpended balance for bridge over Oak Orchard creek feeder at Medina, pursuant to chapter 606-1898.
 Chapter 417 — Reappropriates unexpended balance for bridge over canal at Erie St., Buffalo, pursuant to chapter 611-1898.
 Chapter 417 — Reappropriates unexpended balance for wrought-iron and steel lift-bridge over canal at Brighton, pursuant to chapter 618-1898.
 Chapter 417 — Reappropriates unexpended balance for iron bridge over canal at South George St., Rome, pursuant to chapter 625-1898.
 Chapter 417 — Reappropriates unexpended balance for hoist-bridge over canal at Peterboro, Canastota, pursuant to chapter 626-1898.
 Chapter 417 — Reappropriates unexpended balance for wrought-iron bridge over canal between Fendleton and Pickard's bridge, pursuant to chapter 630-1898.
 Chapter 418 — For a bridge over the canal at South Fitzhugh St., Rochester, pursuant to chapters 32-1897 and 606-1898.
 Chapter 419 — For a bridge over canal at Whitesboro St., Utica, pursuant to chapter 563-1897.
 Chapter 426 — Additional appropriation for bridge over Oak Orchard creek feeder, Shelby St., Medina, pursuant to chapters 606-1898 and 791-1896.
 Chapter 430 — For a bridge over canal at Pine and Lock Sts., Lockport. (Completed February 8, 1902.)
 Chapter 440 — For a steel bridge over canal at 23rd St., Watervliet.
 Chapter 457 — Additional appropriation for hoist-bridge over canal at Minden, pursuant to chapter 596-1899.
 Chapter 537 — Reappropriates unexpended balance for hoist-bridge over canal at Washington St., Utica, pursuant to chapter 397-1898.
 Chapter 547 — Additional appropriation for hoist-bridge over canal at Catherine and Almond Sts., Syracuse, pursuant to chapter 424-1898.
 Chapter 714 — Lift-bridge over canal at 19th St., Watervliet, to be operated by Superintendent of Public Works but at expense of city.
 January 15, — Commission of March 8, 1899, report in favor of Barge canal for 1,000-ton boats; estimated cost, \$80,000,000.
 Surveys for Barge canal made during year by large force of engineers.
- 1901 Chapter 29, Sec. 7 — Method of abating public nuisance caused by water escaping from the canals.
 Chapter 108 — Reappropriates unexpended balance for improvement, pursuant to chapters 569-1897 and 220-1899.

- 1901 Chapter 428 — Additional appropriation and reappropriation of unexpended balance for bridge over canal at Brainard St., Whitesboro, pursuant to chapter 625-1899.
- Chapter 483 — Companies organized for canal navigation may have \$4,000,000 capital stock and 50 years of corporate life.
- Chapter 645 — Appropriation for improvement of bridge at Peterboro St., Canastota.
- Chapter 615 — For an iron or steel bridge at Lyell Ave., Rochester. (Completed July 26, 1902.)
- Chapter 645 — For a bridge over canal at Warren St., Syracuse, the city and the Syracuse Rapid Transit R. R. Co. to bear part of expense.
- Chapter 687 — Reappropriates unexpended balance for hoist-bridge over canal at Chapel St., Lockport, pursuant to chapter 573-1899.
- Chapter 687 — Reappropriates unexpended balance for steel bridge over canal at Minden, pursuant to chapter 596-1899.
- Chapter 687 — Reappropriates unexpended balance for bridge over canal at West Ave., Rochester, pursuant to chapter 549-1899.
- Chapter 693 — For a bridge over canal west of upper Mohawk aqueduct, Rexford Flats.
- Chapter 732 — For a wrought-iron or steel lift-bridge over canal at Plymouth Ave., Rochester, expense of operating same to be paid by the city.
- March 15, — Special Message of the Governor, transmitting State Engineer's report, surveys, etc., of proposed Barge canal.
- October 14, — Death of T. C. Leutze, division engineer, eastern division.
- 1902 Chapter 340 — Amending the "Canal Law," concerning the crossing of canals by street railways.
- Chapter 472 — Appropriation for reconstruction of retaining walls at 14th St., Watervliet.
- Chapter 476 — Additional appropriation and reappropriation of unexpended balance for bridge over canal at Canajoharie, pursuant to chapters 592-1894 and 562-1897.
- September 14, — Break at Durhamville; westerly arch of culvert 37 gives way; navigation delayed 10 days.
- 1903 Chapter 147 — Provision for raising \$101,000,000 for improvement of Erie, Champlain and Oswego canals, if the people approve.
- Chapter 573 — Reappropriates unexpended balance for Plymouth Ave. bridge, Rochester, pursuant to chapter 732-1901.
- Chapter 573 — Additional appropriation and reappropriation of unexpended balance for bridge west of upper Mohawk aqueduct, pursuant to chapter 693-1901.
- Chapter 600 — For restoring approaches to Seneca St. bridge, Weedsport.
- March 2, — State Engineer, responding to legislative inquiries, estimates probable cost of Barge canal at \$100,562,993.
- October 15, — Severe storm badly damages feeder banks at Rexford Flats and the towing-path from lock 27 to Schenectady.
- October, — Experiments with Wood's system of electrical propulsion for canal-boats made near Schenectady.
- November, — Majority in favor of constructing Barge canal, 245,312 votes.
- December 14, — Six surveying parties sent out by State Engineer on Barge canal work.
- 1904 Chapter 632 — Reappropriates unexpended balance for bridge over canal at Canajoharie, pursuant to chapter 476-1902.
- Chapter 729 — For a steel bridge over canal at Willis Ave. and Van Vleck road, Onondaga County.
- Chapter 730 — For reconstruction of embankment, slope walls, etc.
- March 24, — Bad break near Fort Hunter caused by ice jam in Mohawk river; 1,500 ft. embankment near Amsterdam carried away.
- Two miles slope wall on berme bank, between Mays Point and Division bridge slid into the canal.
- December, — First bids opened for Barge canal.

- 1905 Chapter 143—Reappropriation pursuant to chapter 147-1903.
 Chapter 172 — Appropriation for repairs and improvements of structures on canal.
 Chapter 451 — Repeals section 51, chapter 317-1894, giving preference to adjoining owners in sales of abandoned canal lands.
 Chapter 700 — For cleaning State ditches along the canal.
 Chapter 709 — For repairs and improvements to structures on the canal.
 Chapter 710 — Appropriation for interest for year 1905 on canal debt created by chapter 147-1903.
 Chapter 711 — Appropriation for interest for year 1904 on canal debt created by chapter 147-1903.
 Chapter 740 — Amending chapter 147-1903, relating to locks and channel of canal.
 April, — First contracts awarded for Barge canal.
 June 7, — First work on Erie canal division of Barge canal at Waterford.

CHAMPLAIN CANAL.

- 1791 Joint committee advocates opening of water communication; Rensselaerwyck to Lake Champlain.
- 1792 Chapter 40 — Northern Inland Lock Navigation Co. incorporated to open navigation, Hudson river to Lake Champlain.
 Chapter 8 (2nd session) — Locks to be at least 70x10 ft.; navigation companies to lease surplus waters.
 Surveys made by Northern Co., Hudson river to Lake Champlain.
- 1793 Chapter 49 — Right of way limited to 20 ft. each side of canal. Work on canal begun at Stillwater.
- 1795 Chapter 38 — State Treasurer instructed to subscribe for 200 shares of Northern Co.'s stock at £20 per share.
- 1796 Report of companies to Legislature.
- 1812 Commissioners propose a canal from Hudson river to Lake Champlain.
- 1816 Chapter 237 — Commissioners appointed to present estimate.
- 1817 Chapter 262 — Construction authorized; contiguous lands to be taxed; canal fund, commissioners of canal fund formed and canal commissioners continued.
 March 19, — Commissioners present estimate, \$871,000, for canal 30 by 20 by 3 ft., and locks 75 by 10 ft.
 Dimensions changed to those of Erie canal.
 Construction of canal commenced.
- 1818 Twelve miles completed.
- 1819 Chapter 105 — Canal to be opened, Fort Edward to navigable waters of Hudson. Canal opened from Fort Edward to Lake Champlain.
- 1820 Canal (river navigation) opened from Fort Edward to Fort Miller; 17 miles of excavation completed, Saratoga falls south.
 Dam built at Fort Miller falls.
 Contracts let for dam and feeder above Fort Edward.
- 1821 Chapter 78 — State to finish lock and dam at Troy.
 Chapter 36 — Commissioners to borrow not over \$1,000,000 in 1821 and \$1,000,000 in 1822.
 Dam at Saratoga falls and Fish creek aqueduct completed.
 Canal complete to one mile south of Stillwater.
 November 12, — Feeder dam at Baker's Falls badly damaged before completion.
 Survey for Glens Falls feeder made and approved.

- 1822 Chapter 263 — Glens Falls feeder to be made navigable.
Chapter 274 — Speed on canal limited to four miles an hour.
Navigation open from Lake Champlain to Waterford.
Cohoes dam completed.
Fort Edward dam repaired; 900 ft. of water in one continuous sheet.
- 1823 Chapter 96 — \$1,300,000 appropriated for canal fund.
Canal completed; navigation opened September 10.
Glens Falls feeder opened to Sandy Hill.
Troy dam and lock completed.
Tolls on rafts double that on boats.
Only ten boats on the canal in 1821 and in 1823 there were one hundred boats.
- 1824 Chapter 255 — \$1,000,000 appropriated for canal fund.
Hydrostatic lock built on Junction canal.
Dam at Waterford completed; cost \$25,750.
April 10, — Commissioners to improve canal Fort Miller to Fort Edward.
- 1825 Chapter 277 — Independent canal to be built from Fort Edward to Saratoga falls dam.
Chapter 292 — \$270,965.78 appropriated for canal fund.
- 1826 Chapter 249 — Champlain feeder to be made navigable, and locks built thereon.
- 1827 Chapter 9 (R. S.) — Maps to be made of all existing canals.
Canal from Fort Edward to Fort Miller completed; 10 miles 44 chains; 4 locks, lockage 36.5 ft.
Demolition Fort Miller dam commenced.
Commissioners to repair Fort Miller dam.
- 1828 Chapter 294 — \$18,000 appropriated for completion of feeder.
Chapter 315 — Junction Canal Co. incorporated to build canal from junction of Champlain and Erie canals to Hudson river.
Glens Falls feeder completed.
- 1829 Guard-lock at Fort Edward dam completed.
Three locks at Fort Ann rebuilt.
- 1832 Guard-lock at Saratoga falls rebuilt of stone.
Guard-lock on north side of Mohawk rebuilt.
- 1833 Dam built across Mohawk below Cohoes falls.
Chapter 148 — Junction Canal Co.'s time extended for two years.
May floods seriously injure that part of canal which occupies the channel of Wood creek.
- 1834 Saratoga discharge-lock rebuilt of masonry on the old foundation.
Hutchinson's report for improving feeder.
Hutchinson's "Blue line" maps completed.
- 1835 Guard-lock, Glens Falls feeder, rebuilt of stone.
Troy dam injured by floating ice in the spring thoroughly repaired and 8,000 cu. yds. slate rock put on the dam.
Wooden waste-weir at Stillwater replaced by one of stone, 68 ft. long, 2 wing walls, 426 perches of masonry.
- 1836 Chapter 453 — Glens Falls feeder to be enlarged and equipped with stone locks.
Waste-weirs Nos. 6 and 10 rebuilt of stone masonry.
Fort Edward lock rebuilt of cut stone laid in hydraulic cement.
Reconstruction Glens Falls feeder, locks put under contract.
Waste-weirs at Dunham's Basin rebuilt of stone.

- 1837 Feeder widened at Glens Falls.
220 ft. of Troy dam carried away.
2,100 cu. yds. added to the wall intended to secure the canal at Whitehall.
New lock of hammer-dressed stone opposite dam across Wood creek completed.
Three new locks being built on Glens Falls feeder completed.
- 1838 Aqueduct at Fort Edward creek replaced by a stone culvert.
Nine remaining locks on Glens Falls feeder rebuilt of stone brought from Kingsbury quarries.
- 1839 Feeder enlargement completed; 12 locks rebuilt of stone.
Towing-path wall at Whitehall completed, 840 ft., 12 to 18 ft. high, hammer-dressed stone laid in cement.
Commissioners to inspect Junction canal with a view of its purchase by the State.
Bassett's lock rebuilt.
- 1840 Chapter 280 — Commissioners authorized to purchase Junction canal for not over \$10,000.
"Flynn" and "Moses Kill" locks and aqueducts across Fish creek and Moses kill completed.
Five miles stone slope wall completed.
- 1841 Chapter 111 — \$75,000 to be used for improving Glens Falls feeder.
July 31, — Work under chapter 111 all placed under contract.
- 1842 Improvement to Glens Falls feeder completed.
Lock at Fort Miller and one at Waterford completed.
- 1843 Saratoga towing-path bridge carried away.
Glens Falls feeder dam raised 18 inches.
Pier built in Wood creek, 216 ft. long.
Fort Edward feeder and dam abandoned; 100 ft. of dam removed.
- 1844 Schuylerville aqueduct enlarged; cost \$3,500.
Saratoga dam raised, and planked, and a new apron constructed.
- 1845 New change bridge built at junction of Erie and Champlain.
Stone dam and lock built on Wood creek.
Four miles quarried stone slope wall constructed north and four miles field stone, south of Fort Edward.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Guard-lock on feeder rebuilt.
New stone waste-weirs built at Flynn's lock and at Cornell's.
- 1847 Becker's lock at Stillwater rebuilt.
- 1848 Waste-weir at Wilbur's basin struck by lightning and carried away; afterward repaired.
- 1849 Chapter 393 — Bridge to be built at Whitehall.
New stone lock built above Waterford, cost \$12,000.
Fort Miller side-cut closed.
- 1850 Chapter 263 — Fort Miller dam to be abandoned.
New lock built a few miles above Waterford.
Assembly committee reports on ship canal.
Whitehall locks reduced from 3 to 2, and contracts let for reconstruction.
December 3, — Canal board by resolution, abandon Fort Miller dam and side-cut.
- 1851 Fort Miller dam removed.
Waste-weir near Whitehall rebuilt.

- 1852 Lock No. 7, at Waterford, rebuilt.
November 27, — Breach 300 ft. long and 10 ft. below canal bottom caused by muskrats; navigation suspended 6 days.
Pier built on lower side of dam at head of Glens Falls feeder.
- 1853 Chapter 620 — \$10,000 appropriated toward rebuilding Whitehall locks, size of Erie.
- 1854 Constitution, Art. VII, Sec. 3, — Locks to be enlarged to size of Erie.
Chapter 330 — \$25,000 appropriated for enlarging locks.
New aqueduct completed at Schuylerville.
- 1855 Contract let to rebuild locks at Saratoga dam and Whitehall.
Chapter 168 — \$10,000 appropriated to improve Whitehall harbor.
New guard-lock built on summit level.
Contracts let to keep canal in repair for five years.
Moses kill aqueduct rebuilt, cost \$18,935.92.
- 1856 Chapter 148 — \$25,000 appropriated for enlarging locks.
Wooden lock on Glens Falls feeder rebuilt, \$5,724.18.
New combined Waterford locks completed.
- 1857 Chapter 365 — \$141,481.04 appropriated.
Commissioners recommend enlargement of canal to size of Erie.
One single and two combined locks at Fort Ann completed.
Single lock at Fort Miller completed.
Two of combined locks at Whitehall completed.
Saratoga dam rebuilt.
- 1858 Chapter 329 — \$119,321.40 appropriated from Erie for locks.
Whitehall combined locks all enlarged.
July 12, — Breach near Coreville, cost \$5,313.53.
- 1859 Chapter 149 — \$60,115 appropriated for rebuilding locks and improving navigation on Champlain canal.
Chapter 368 — Bridge to be built over old feeder at Fort Edward.
Chapter 445 — Culvert to be built under canal at Stillwater.
Estimated cost for 5 ft. of water, \$167,645.
Fort Miller bridge carried away.
Eleven of the 25 locks on Champlain canal enlarged to date.
- 1860 Chapter 213 — \$170,000 appropriated for enlargement of canal, 5 ft. of water, 35 ft. bottom; locks to be rebuilt.
- 1861 Bassett's lock rebuilt; banks raised and protected.
- 1862 Chapter 137 — \$42,000 reappropriated for improving canal and Glens Falls feeder; also rebuilding locks.
Estimates for gunboat locks, 25 ft. wide, admitting boats 150 ft. long, \$815,000; enlarging prism and structures to correspond, \$3,770,190.
Dam at Cohoes raised 18 inches.
Weigh-lock at Waterford completed; cost, with scales, \$22,115.70.
Dam built at Parish lock, Wood creek.
South guard-lock at Cohoes completed.
May 29, — Break at Coleville, 900 ft. towing-path, 200 ft. embankment and 1,200 ft. canal bottom carried out; cause unknown.
- 1863 Parish lock (No. 17) completed.
- 1864 Chapter 186 — \$295,000 additional appropriation for enlargement of canal and feeder to 5 ft. of water and 35 ft. bottom.
Fort Edward lock completed.
- 1865 March 16, 17, 18, — Freshet badly damages canal and structures, Mechanicville dam gives way and large section berme bank carried away.

- 1866 Chapter 33 — Survey for slack-water navigation, Troy to Fort Edward, with stone dams and locks, 225x25 ft., also for canal, 7 ft. deep, same sized locks, from Erie junction to Whitehall.
Chapter 156 — \$247,500 for improvement of canal and Glens Falls feeder, pursuant to chapter 186-1864.
Chapter 304 — Reappropriation of the fund provided by chapter 186-1864.
Chapter 668 — Bridge to be built at Saratoga St., Schuylerville.
- 1867 Chapter 344 — Bridge to be built at Case St., Fort Edward.
Chapter 526 — Iron bridge to be built at Broad St., Waterford. (Completed same year.)
Chapter 579 — \$29,300 appropriated for lock and sluices; \$15,000 toward Fort Miller lock; \$50,000 for rebuilding Cohoes dam of stone.
Plans and estimates under chapter 33-1866 submitted.
June, — Break near Fort Ann owing to high water in Wood creek, repaired in 3 days.
Improvements from Cohoes to Saratoga dam completed.
Moses kill lock completed.
- 1868 Chapter 116 — \$22,000 appropriated for Fort Miller lock.
Chapter 346 — \$6,931.31 reappropriated from chapter 304-1866.
Chapter 415 — Iron bridge to be built at Fort Miller.
Chapter 419 — Iron bridge to be built at Ferry St., Schuylerville. (Completed 1869.)
Chapter 438 — Bridge to be built at William St., Mechanicville.
Chapter 451 — Canal commissioners to lease surplus waters at Fort Edward lock.
Chapter 715 — \$95,700 appropriated for canal and feeder and bridge at McIntyre St., Fort Edward; \$10,000 for Becker's lock.
Chapter 715 — Big bevel to be cut off Glens Falls feeder locks.
45 miles of canal improved to 35 ft. bottom, 5 ft. of water.
Seventeen locks enlarged to 110x18 feet.
September 13, — Unprecedented storm badly damages section No. 2; navigation suspended 3 weeks.
Fort Miller lock completed.
- 1869 Chapter 865 — Farm bridge, stone abutments, to be built at Waterford.
Chapter 877 — \$25,000 for rebuilding Glens Falls feeder dam of stone; \$17,000 for Hewitt's lock; \$10,000 for guard-lock on feeder and \$27,000 for rebuilding Fort Miller dam of stone.
Chapter 877 — \$80,000 for improvement Waterford to Fort Ann; \$31,800 for raising Wood creek towing-path; \$6,000 for wall at Fort Edward and \$7,000 for improvements at Schuylerville.
New iron bridge at East St., Fort Edward, completed.
New aqueduct completed at Fort Edward in place of the culvert carried away during previous fall.
April, — Saratoga dam partly carried away during great freshet; successfully repaired during high water without interrupting navigation.
Becker's lock rebuilt.
- 1870 Chapter 788 — Appropriates \$425,000 for enlargement of canal, to secure a prism 58 and 44 by 7 feet.
Hewitt's lock completed, 110 feet by 18 feet.
Guard-lock at head of Glens Falls feeder so far completed as to be used during next season.
Prism from Saratoga to Dunham's Basin bottomed out to uniform bottom width 35 feet.
State Engineer estimates cost of proposed enlargement at \$2,850,574.72.
- 1871 Chapter 778 — Troy dam to be rebuilt in 30 days.
Chapter 930 — Appropriation for building two enlarged locks, dredging and other improvements to canal.
January 15, — Work of rebuilding Glens Falls feeder dam begun by canal commissioners, contractor having surrendered his contract.

- 1871 Canal deepened to 5 feet of water.
Guard-lock at head of Glens Falls feeder completed.
Flynn's lock completed.
- 1872 Stone dam, Cohoes, completed, 1,616 feet between abutments, built of massive blocks laid in hydraulic cement; cost \$220,529.88.
Enlargement proceedings under chapter 788-1870 begun.
Glens Falls feeder dam completed.
- 1873 Chapter 766 — Appropriates \$23,000 for completing Schuylerville aqueduct.
Chapter 766 — Wooden lock at Glens Falls feeder to be rebuilt of stone.
Bad break near Waterford owing to faulty construction by contractors; cost of repairs, \$33,000.
Enlargement proceedings stopped — no funds.
- 1874 Chapter 399 — Appropriates \$500,000 for enlargement of canal, pursuant to chapter 788-1870, but requires revised surveys, etc.
Locks completed at Cohoes, Waterford and Wood creek.
New stone dam at Fort Miller bridge completed.
- 1875 Chapter 594 — Appropriation for completion of bridge over Fort Edward feeder; also wooden lock, Glens Falls feeder.
January, — Canal board increases the number of sections on canal from 2 to 3.
Resurvey and revised plans for enlargement completed, pursuant to chapter 399-1874; State Engineer's estimate of the cost of enlargement, \$2,698,-400.06.
The old wooden Glens Falls feeder lock rebuilt of stone, pursuant to chapter 594-1875.
- 1876 Chapter 185 — Appropriates \$300,368.82 unexpended balance of chapter 399-1874, for enlarging canal, changing plan to 6 ft. depth, and curtailing work.
Chapter 383 — Appropriates \$25,000 for reconstructing Glens Falls feeder.
Chapter 425 — Repeals chapter 383-1876.
State Engineer completes revised plans; estimates cost under chapter 185-1876, at \$241,574.46.
- 1877 Lock No. 6 completed; all locks enlarged to 110 feet by 18 feet.
Forty-nine abutments built during the fiscal year.
- 1878 Chapter 202 — Reappropriates unexpended balance of chapter 185-1876.
Chapter 238 — Bridge over canal at Whitehall to be removed to a point farther north.
Chapter 373 — Appropriation for dredging canal basin at Whitehall.
- 1879 Wooden guard-lock at Cohoes removed and a larger lock of stone substituted.
- 1880 Chapter 258 — Reappropriates unexpended balance of chapter 202-1878.
Scarcity of water, severe drought, impels division engineer to advise construction of reservoir above Glens Falls.
- 1882 Chapter 97 — Reappropriates unexpended balance of chapter 258-1880.
- 1884 Chapter 154 — Iron bridge to be built across canal at Watervliet.
Chapter 301 — Reappropriates unexpended balance of chapter 97-1882.
Chapter 360 — For an iron bridge over canal at Whitehall.
June 9, — Break at Coleville, delaying navigation 15 days; cost of repairs, \$14,685.53.
- 1885 Many valuable and needed canal improvements made to canal and Glens Falls feeder during the year.
- 1886 Chapter 336 — Lift-bridge to be built over canal at Mechanicville. (Completed 1887.)
Chapter 441 — Appropriation and reappropriation for improvement of canal and Glens Falls feeder.

- 1886 Chapter 554 — Iron bridge to be built over canal at Saratoga St., between Cohoes and Waterford. (Completed 1887.)
Cohoes dam found to be moving out of line; further displacement checked by three stone buttress walls, placed in front of dam.
- 1887 Chapter 118 — Appropriates \$70,000 for increasing depth of canal.
Chapter 168 — Bridge to be built over canal at Ship St., Cohoes.
Lift-bridge built at Mechanicville.
- 1888 Chapter 126 — Additional appropriation for completion of bridge over canal at Ship St., Cohoes, pursuant to chapter 168-1887.
Chapter 320 — Lift-bridge to be built at Broad St., Waterford. (Built 1891.)
Chapter 416 — Appropriates \$105,000 for increasing depth of canal.
- 1889 Chapter 552 — Additional appropriation for bridge over canal at Ship St., Cohoes, pursuant to chapters 168-1887 and 126-1888.
Chapter 568 — Appropriates \$130,000 for general improvement of canal.
9,000 feet of canal widened between locks Nos. 7 and 8.
- 1890 Chapter 168 — Appropriates \$110,000 for general canal improvements.
May 4, — About 55 feet new vertical wall and tow-path swept out near Mechanicville; navigation delayed 25 days.
Traffic largely increased; tonnage moved during season 1,520,757 tons, a gain over 1889 of more than 330,000 tons; greatest ever moved on this canal.
5.41 miles of canal widened.
- 1891 Chapter 271 — For constructing a wall at head of guard-lock on Glens Falls feeder; also for repairing feeder.
1.74 miles of canal deepened and widened; 16 miles thus treated since 1885; 40 miles requiring improvement.
- 1892 Chapter 382 — Reappropriates unexpended balance for improving canal.
- 1893 Chapter 110 — For a bridge over the canal at Whitehall.
Chapter 60 — The water of Trout or Ensign brook to be conveyed under canal, town of Halfmoon, Saratoga County.
Chapter 119, section 5 — Appropriates \$50,000 for general improvement of canal.
Chapter 294 — Appropriation for construction of approaches to bridge over canal at Waterford.
Chapter 569 — Appropriation for building bridge No. 15, Champlain canal.
Chapter 643 — Appropriates \$90,000 for repairing Cohoes dam.
August 8, — Break on Glens Falls feeder near D. & H. Co.'s bridge; navigation delayed 11 days.
- 1894 Chapter 278 — For repairing and improving Glens Falls feeder.
Chapter 561 — Appropriation for repairing stone wall at Fort Edward.
Chapter 572 — Appropriation for improving the canal.
Chapter 594 — For an iron bridge over canal at Mechanicville. (Completed 1895.)
September 24, — Dam across Mohawk river, at Cohoes, extensively repaired.
- 1895 Chapter 79 — Bonds to be issued for improvement of canal to seven ft. depth.
Chapter 83 — For completing stone wall at Fort Edward.
Chapter 105 — For repairs to berme bank at Schuylerville.
Chapter 143 — For rebuilding bridge over Glens Falls feeder, Sandy Hill.
Chapter 234 — For repairs and improvements to Glens Falls feeder.
Chapter 286 — For extending and repairing walls, Glens Falls feeder.
Chapter 298 — For raising towing-path between Smith's and Dunham's basins.
April 30, — 1,200 lin. ft. vertical wall along towing-path side, Glens Falls feeder, completed, pursuant to chapter 278-1894.
November 5, — People ratify provisions of chapter 79-1895 by majority of 276,886 votes.

- 1896 Chapter 254 — For an iron bridge over canal at Northumberland.
 Chapter 364 — For construction of a dock and culvert, Waterford.
 Chapter 794 — Amends chapter 79-1895, regulating the making of contracts for work on canal.
 Chapter 796 — For improving Glens Falls feeder at Maple St., Sandy Hill.
 Chapter 798 — For a bridge over Glens Falls feeder at Glen St. (Completed May 1, 1897.)
 Work of deepening to 7 ft. commenced.
- 1897 Chapter 43 — Unexpended balance of chapter 79-1895 reappropriated for improvement of canal.
 Chapter 569 — Appropriation for carrying on improvements under chapter 79-1895.
 Chapter 570 — For a bridge over canal at Waterford.
 Chapter 575 — For a bridge over side-cut at Fourth St., Waterford. (Completed May 1, 1898.)
 Chapter 578 — For strengthening berme bank, Glens Falls feeder. (Completed 1898.)
 Chapter 778 — For construction of retaining wall at Ship St., Cohoes. (Completed 1898.)
- 1898 Chapter 619 — Additional appropriation for bridge over canal at Waterford, pursuant to chapter 570-1897.
 Chapter 623 — For a steel bridge over Glens Falls feeder at Main St., Sandy Hill.
 Chapter 629 — For a swing-bridge over canal at Waterford.
 Improvement under chapter 79-1895 suspended; funds exhausted.
 October 5. — Break at Wilbur's basin, caused by heavy rains; tow-path submerged for seven miles; navigation delayed only 2½ days.
 Locks Nos. 6 and 7 rebuilt.
- 1899 Chapter 219 — Reappropriates unexpended balance for swing-bridge over canal at Waterford, pursuant to chapters 570-1897 and 619-1898.
 Chapter 220 — Reappropriates unexpended balance for improvement of canal, pursuant to chapter 569-1897.
 Chapter 519 — For the construction of a canal and pneumatic lock to connect the Erie and Champlain canals, in Cohoes. (Nothing done.)
 Chapter 544 — Authorizes canal board to terminate contracts made for improvement of canal, under chapter 79-1895.
 Chapter 613 — For a bridge over canal at Ontario St., Cohoes.
 Chapter 665 — Appropriation for repairs and improvements to Glens Falls feeder.
- 1900 Chapter 417 — Reappropriates unexpended balance for steel bridge over Glens Falls feeder, Main St., Sandy Hill, pursuant to chapter 623-1898.
 Chapter 443 — Additional appropriation for bridge over canal near Burton's sawmill, Waterford, pursuant to chapter 629-1898.
 Chapter 419 — Appropriation for steel bridge over Glens Falls feeder, Sandy Hill, pursuant to chapter 623-1898.
- 1901 Chapter 108 — Reappropriates unexpended balance for improvement of canal, pursuant to chapters 569-1897 and 220-1899.
 Chapter 423 — For a new steel bridge over Glens Falls feeder at Queensbury. (Completed June, 1902.)
 Chapter 645 — For improvement of bridge over canal at Park Ave., Mechanicville.
 Chapter 682 — Additional appropriation and reappropriation for bridge over canal at Ontario St., Cohoes, pursuant to chapter 613-1899.
 Chapter 687 — Reappropriates unexpended balance for improvement of bridge over canal at Division St., Waterford, pursuant to chapter 219-1899. (Completed October, 1901.)
 Chapter 694 — For a bridge over canal, connecting Burke Ave. and Francis St., Mechanicville.
 Chapter 697 — For a new steel bridge over canal at Fulton St., Waterford. (Completed April, 1902.)

- 1903 Chapter 147 — Barge canal to be built, including Champlain route.
 Chapter 567 — Appropriation for a bridge over Glens Falls feeder.
 Chapter 599 — Additional appropriation and reappropriation for bridge over canal, connecting Burke Ave. and Francis St., Mechanicville.
 Chapter 600 — For vertical wall at Comstocks.
- 1904 April 24, — Work of improvement begun—first work on any portion of Barge canal.
 Bridges Nos. 69, 77 and 94 replaced by new bridges during the fiscal year.
 State dam and Cohoes dam badly damaged by spring floods.
 No. 14 and six foot bridges built on Glens Falls feeder during the year.
 Dam near lock No. 20 rebuilt.
- 1905 Chapter 143 — Reappropriation for improvement of canal, pursuant to chapter 147-1903.
 Chapter 172 — For repairs and improvement of structures on canal.
 Chapter 700 — Appropriation for cleaning out State ditches along canal.
 Chapter 709 — Appropriation for repairs and improvements to structures on canal.
 Chapter 740 — Amends chapter 147-1903, relating to locks and channel of canal.

OSWEGO CANAL.

- 1808 Western Lock Navigation Co. surrenders grant west of Oneida lake.
 James Geddes to survey between Ontario and Oneida lakes.
- 1809 Report showing Oneida lake to Three River Point, 18 miles, fall 12.5 ft.; thence to Oswego, 24 miles, fall 111.5 ft.
- 1819 Chapter 105 — \$6,000 appropriated for side-cut, Erie canal to Salina, 1 mile, 43 chains. (Work completed during year.)
 April 13, — Concurrent resolution, survey to be made of Oswego river to Three River Point and Seneca river to Onondaga lake.
- 1820 Chapter 117 — \$25,000 appropriated for improvement of Oswego river.
 Report of D. S. Bates for canal from Salina to Oswego, 36 miles, fall 156 ft.
 Land Office to sell State lands for canal funds.
- 1822 Chapter 40 — Onondaga lake to be lowered to Seneca river level. (Work completed.)
 Chapter 274 — Salina side-cut to be extended to Onondaga lake.
- 1823 Chapter 205 — Commissioners to survey Oswego river from falls to Lake Ontario.
 Chapter 241 — Oswego Canal Co. incorporated, capital stock \$10,000.
 Salina side-cut extended.
- 1824 Hutchinson's report on canal from head of falls to Lake Ontario; cost \$227,568.33.
 Chapter 279 — \$28,000 appropriated for improvement of Oswego river.
- 1825 Chapter 272 — \$160,000 authorized to build canal.
 Construction begun; 18 miles river improvement, 14 miles of canal.
- 1826 Canal completed from Onondaga lake to Three River rift, 10 miles.
 Three important dams built across Oswego river; several guard and lift-locks built and material delivered for completion of those to be built.
- 1827 Chapter 219 — \$210,000 appropriated to connect Oswego canal with Erie canal at Salina.
 Chapter 9 (R. S.) — Maps to be made of all existing canals.
 Completion of the canal greatly retarded by sickness among laborers.
- 1828 Chapter 275 — Not to exceed \$15,000 to be borrowed for canal.
 December 10, — Canal completed.

- 1829 April 28. — Entire canal open to navigation.
Banks along Onondaga lake faced with timber.
Petition from citizens of Utica praying that the waters of Oneida lake be lowered.
- 1834 Hutchinson's "Blue line" maps completed.
- 1835 Wooden guard-locks at Horseshoe dam rebuilt.
- 1836 Chapter 79 — Commissioners to rebuild Mud lock. (Rebuilt of stone.)
Unusual high water in spring floods greatly injure the canal.
- 1837 Salina side-cut taken by the State.
Pier built at Oswego, 540 ft. long.
October 26, — Dam No. 7 in course of repairs, badly damaged by sudden rise in river, 60 ft. east end of dam carried away.
- 1838 Two hundred ft. of Oswego falls dam rebuilt.
- 1839 Piers built at Phoenix, Horseshoe dam and lock No. 12, 600 ft. long, the former a reconstruction, the latter two new constructions.
- 1841 Chapter 183 — Commissioners to excavate Onondaga outlet to reduce lake to river level, also take waters Onondaga creek for Oswego canal.
Small drainage canal reopened from Onondaga lake to Seneca river.
- 1842 Chapter 114 — "Stop law," all work excepting necessary repairs stopped.
- 1843 Unusually high water in Onondaga lake and Seneca and Oswego rivers, delaying opening of the canal till early in May.
- 1845 Chapter 128 — Commissioners to take Liverpool side-cuts and treat them as a part of the Oswego canal.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Oswego dam badly damaged by flood.
- 1847 Chapter 262 — \$100,000 appropriated toward enlargement of locks to 110x 18 ft.
Waterhouse creek aqueduct enlarged and rebuilt.
- 1849 Chapter 214 — \$100,000 appropriated by chapter 262-1847, reappropriated.
- 1850 Chapter 371 — Sections 2 and 3 of chapter 214-1849, repealed.
- 1851 Chapter 343 — Chapter 262-1847 renewed.
Chapter 501 — \$200,000 to be made available in 1851 and \$200,000 in 1852 for enlargement of locks.
Contracts let for enlargement.
Three locks at Fulton and one at Oswego completed.
- 1852 Five locks enlarged to date.
Chapter 270 — An act in relation to the enlargement of the Erie and Oswego canals.
Chapter 281 — Line of Oswego canal at Phoenix to be changed.
- 1853 Chapter 186 — Chapter 262-1847 renewed.
Chapter 440 — Bridge to be built at Bridge St., Phoenix.
Chapter 473 — Repeals chapter 270-1852.
Chapter 620 — \$50,000 appropriated.
- 1854 Constitution, Art. VII, Sec. 3, — Legislature to appropriate annually for enlargement of canals; also authorizes enlargement of Oswego canal.
Chapter 16 — \$10,000 appropriated for improvement of canal.
Chapter 329 — \$169,000 appropriated for enlargement Oswego canal.
Chapter 380 — \$179,000 appropriated for fiscal year.
Dam No. 7 rebuilt.

- 1855 Seventeen lift-locks and 4 guard-locks enlarged.
Enlarged boats in use, owing to completion of improved locks.
- 1856 Chapter 95 — Salina side-cut to be extended; lake to be lowered.
Chapter 148 — \$140,000 appropriated for fiscal year.
Iron bridges built at Salina and Willow Sts., Syracuse.
Phoenix dam raised 4 ft., 2 inches.
Dam No. 5 rebuilt.
Work suspended; no funds.
- 1857 Chapter 365 — \$444,904 appropriated.
Iron bridge built at junction with Erie canal.
Guard-lock No. 2 completed.
Oswego stone dam completed.
- 1858 Chapter 329 — \$468,444.62 appropriated from Erie.
- 1859 Chapter 149 — \$138,640 to be raised by taxes for enlargement of the canal.
Chapter 326 — \$138,034.96 appropriated by chapter 365-1857 reappropriated.
Twenty-three miles enlargement completed.
- 1860 Chapter 213 — \$194,117 appropriated; big bevels to be cut from enlarged locks and bridges raised to 12 ft. clearance.
Chapter 413 — Bridge to be built over the canal at Volney.
- 1861 Dam at Phoenix raised 1 foot, 8 inches, to 7 ft. above canal bottom.
Braddock's rapids dam lowered to 7 ft. above canal bottom.
Lift-lock No. 6 completed.
- 1862 Chapter 187 — \$35,000 reappropriated for enlargement and completion of canal.
Chapter 169 — Enlargement declared completed.
Mud lock rebuilt.
- 1863 Chapter 311 — Surveys and estimates to be made for gunboat locks, 225x26 ft.
Chapter 484 — \$30,000 appropriated for a weigh-lock on the canal.
- 1864 Chapter 475 — Phoenix and Horseshoe dams to be rebuilt of masonry.
Estimate made for gunboat locks, pursuant to chapter 311-1863.
- 1865 Chapter 470 — All dams to be rebuilt of masonry upon signs of failure.
Chapter 483 — Concerning the completion of the weigh-lock at Oswego.
Chapter 747 — Reappropriates certain funds for completion of weigh-lock at Oswego.
Chapter 752 — Amends chapter 475-1864, concerning rebuilding Phoenix and Horseshoe dams.
March 16, 17, 18, — Freshet damages canal, also High, Minetto, Van Buren and Oswego Falls dams.
- 1866 Chapter 611 — For a bridge over canal near Oswego weigh-lock.
Weigh-lock completed at Oswego.
High dam completed.
Horseshoe dam dispensed with.
- 1867 Chapter 500 — Iron bridge to be built over canal at Utica St., Oswego.
Chapter 579 — \$80,000 appropriated.
Chapter 605 — Iron bridge to be built over canal at Broadway St., Fulton.
Stone dams at Oswego Falls and Phoenix completed.
June, — Great freshet, 10 miles of towing-path between Mud lock and Phoenix under several feet of water.
- 1868 Chapter 108 — Bridge to be built over new Onondaga outlet.
Chapter 715 — \$50,000 appropriated for rebuilding High dam of stone.
Braddock's rapids dam rebuilt of stone.

- 1869 Chapter 877 — \$13,000 for deepening river; \$25,000 for raising banks; \$4,000 for vertical wall near Bradley's creek; \$4,000 for bridge at Fulton; \$15,000 for docks on side-cuts, Salina.
Dock at Greenpoint completed.
- 1870 Chapter 767 — Appropriation for improvement of canal.
- 1871 Chapter 930 — \$22,000 appropriated for rebuilding High dam.
Minetto dam rebuilt of stone.
- 1872 Chapter 850 — Appropriates \$88,000 for completing High dam.
- 1873 Chapter 766 — Appropriates \$10,000 for improvement to canal, also \$80,000 for completing High dam.
April, — Freshets submerge canal its entire length.
High dam completed.
- 1874 Chapter 382 — Turntable bridge to be built at Salina and Bridge Sts., Syracuse.
- 1875 Chapter 594 — Appropriation for improvements to canal.
- 1876 Chapter 425 — Appropriation for river and basin in Oswego.
- 1877 Dams protected by sloping aprons as required by chapter 425-1876.
- 1893 Chapter 10 — Syracuse to substitute a swing-bridge in place of elevated bridge over canal at James St.
Chapter 495 — Oswego canal fund, appropriation.
- 1886 Chapter 616 — Locks on canal to be lengthened to 220 ft.
- 1887 Chapter 113 — Appropriation for improvement of the canal.
Locks Nos. 5 and 6 and guard-lock No. 1 lengthened.
- 1888 Chapter 416 — Appropriation for increasing lockage capacity and improvement of canal.
Lock No. 7 and guard-lock No. 4 lengthened.
- 1889 Chapter 493 — Reappropriates unexpended balance for lengthening locks, pursuant to chapter 113-1887.
Chapter 568 — Appropriation for increasing the lockage capacity of the canal.
Lock No. 11 and guard-lock No. 3 lengthened.
- 1890 Chapter 168 — Locks to be lengthened and canal improved.
Chapter 338 — Reappropriates unexpended balance for canal improvement, pursuant to chapter 416-1888.
Locks Nos. 9 and 10 lengthened.
- 1891 Chapter 226 — For construction of canal wall at Oswego.
Locks Nos. 8 and 12 lengthened.
- 1892 Chapter 124 — Appropriation for payment of amounts due for lengthening locks on canal.
Chapter 229 — For a swing-bridge at North Salina St., Syracuse.
- 1893 Chapter 93 — For an iron bridge over canal at Sycamore St., Liverpool.
(Removed from Geddes St., Erie canal.)
Chapter 119 — Appropriates \$10,000 for improvement of canal, also \$5,000 for ditch at Liverpool.
- 1894 Chapter 466 — For construction of a sewer under the canal at Fulton.
Chapter 572 — Additional appropriation, \$30,000, for improving canal, pursuant to chapter 119-1893.
Steel apron built at Braddock's dam and a stone apron at Oswego dam.

- 1895 Chapter 79 — Bonds to be issued for improvement of canal to 9 feet depth.
Chapter 219 — Reappropriation for bridge over canal at Sycamore St., Liverpool.
November 5, — People ratify provisions of chapter 79-1895 by majority of 276,886 votes.
- 1896 Chapter 482 — Reappropriation for improvement to canal.
Chapter 794 — Amending chapter 79-1895, regulates the making of contracts for work on canal.
Contracts let for raising Braddock's, High, Oswego and Minetto dams, lengthening lock No. 18, and improving prism.
- 1897 Chapter 43 — Unexpended balance of chapter 79-1895 for improvement of canal reappropriated.
Chapter 113 — For a steel bridge at Oneida St., Fulton. (Completed 1898.)
Chapter 569 — Appropriation for carrying on improvements to canal provided by chapter 79-1895.
Contract let for raising Oswego Falls dam.
Lake Ontario level completed.
- 1898 Lock No. 18 lengthened.
- 1899 Chapter 220 — Reappropriates unexpended balance for improvement of canal, pursuant to chapter 569-1897.
- 1900 Chapter 411 — Preliminary survey for Barge canal.
Chapter 477 — Reappropriates unexpended balance for Oneida and First St. bridge, Fulton, pursuant to chapter 113-1897.
- 1901 Chapter 108 — Reappropriates unexpended balance for improvement of canal, pursuant to chapters 569-1897 and 220-1899.
- 1902 Chapter 471 — For an iron bridge over canal at North Salina St., Syracuse.
- 1903 Chapter 147 — Barge canal to be built, including Oswego route.
Chapter 600 — For a hoist-bridge over canal at Willow St., Syracuse.
- 1905 Chapter 143 — Reappropriation for improvement of canal, pursuant to chapter 147-1903.
Chapter 172 — Reappropriates unexpended balance for lift-bridge at Willow St., Syracuse, pursuant to chapter 600-1903.
Chapter 709 — Appropriation for repairs and improvements to structures on canal.
Chapter 740 — Amends chapter 147-1903, relating to locks and channel of canal.

CAYUGA AND SENECA CANAL.

- 1813 Chapter 144 — Seneca Lock Navigation Co. incorporated to build canal between Cayuga and Seneca lakes; capital stock \$50,000.
- 1814 Chapter 122 — Capital stock increased to \$60,000.
- 1817 Chapter 93 — Capital stock increased to \$72,500; time extended to 1819.
- 1818 Locks at Seneca Falls completed and boat passed from Schenectady.
- 1820 Chapter 93 — Canal to be completed in 1822.
- 1821 Chapter 229 — Cayuga Inlet declared public highway.
Canal completed; cost about \$70,000; \$21,000 subscribed by the State.
- 1824 Chapter 168 — Commissioners to examine Seneca river with view of improving navigation.
- 1825 Chapter 271 — Commissioners to build canal from Seneca lake to Montezuma and purchase property of Navigation Co.; total cost not to exceed \$150,000.
Commissioners report, estimating cost \$100,000.

- 1826 Rights of Seneca Co. purchased for \$33,867.18; \$19,155.04 due to general fund for State's stock.
Contracts let for canal, except from Waterloo dam to Seneca lake.
- 1827 Chapter 219 — \$45,000 appropriated.
Chapter 9 (R. S.) — Maps to be made for all existing canals.
- 1828 Chapter 119 — Commissioners to construct canal to East Cayuga; \$10,000 appropriated.
Chapter 290 — Commissioners to lower Seneca lake outlet 20 ft.
Branch to East Cayuga resurveyed (April) and put under contract (May).
November 15, — Canal completed, length 21½ miles; 11 locks, 90x15 ft.; lockage 73.5 ft.; water-surface 40 ft.; 4 ft. deep.
- 1829 Chapter 325 — \$8,000 appropriated for canal to East Cayuga; \$24,000 for Cayuga and Seneca.
Chapter 360 — Outlet of Seneca lake to be deepened to bring lake to same level; inlet to be deepened 18 inches, 36 ft. wide.
Branch canal to East Cayuga completed.
- 1832 Renewed difficulty in outlet due to lack of water.
Towing-path bridge across river below Seneca Falls rebuilt, 247 ft.
- 1834 Concurrent resolution, survey for improving Cayuga inlet.
Hutchinson's "Blue line" maps completed.
- 1835 Chapter 202 — \$10,000 appropriated for removal of sand bar in Cayuga inlet.
- 1836 Chapter 453 — Commissioners to rebuild locks of stone same width as enlarged Erie.
Towing-path bridge built above upper dam, 285 ft.
May 25, — Bad break at Seneca Falls suspends navigation 11 days.
- 1838 Sand bar at Cayuga inlet removed.
Pier 1,550 ft. long built at Cayuga inlet.
- 1839 Canal board favors enlargement of canal.
Channel in inlet 5.5 ft. deep, 80 ft. wide, completed.
- 1840 Chapter 302 — Channel to be cut through bar at northeast bend of Seneca lake, and height of water regulated; \$12,000 appropriated.
Chapter 316 — Cayuga inlet to be kept clear.
- 1841 Chapter 212 — Channel through northeast bend to be made navigable; (nothing done).
Dams built at Seneca Falls and Waterloo.
- 1842 Chapter 114 — "Stop law," all work excepting necessary repairs stopped.
- 1843 Spring floods damage canal.
- 1844 Chapter 313 — Amends chapter 302-1840 and repeals chapter 212-1841; lake level to be lowered one foot.
- 1845 Work on lake level completed. Regulating-weir built at Waterloo.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
- 1847 Chapter 251 — \$1,500 appropriated for keeping open Cayuga inlet for vessels drawing 5 ft. of water.
Chapter 348 — Locks to be enlarged to size of Erie, when necessary to rebuild.
Dam below Seneca Falls rebuilt.
- 1848 Commissioners adopt plans for composite locks; their enlargement commenced; lock at foot of Seneca lake and at Chamberlain's dam to be dispensed with.

- 1849 Chapter 213 — Commissioners to build 4 miles of canal from lock 9 to Montezuma level.
Two enlarged, composite locks completed and brought into use at Waterloo.
- 1850 Estimated cost of separate canal, \$128,877.37.
Five enlarged locks in use.
- 1851 Chapter 535 — Cayuga outlet to be improved.
Seneca Falls side lock completed.
Two piers, 350 and 400 ft., built on Seneca outlet.
- 1852 Chapter 246 — Commissioners to assume charge of Cayuga inlet.
- 1853 Chapter 620 — \$20,000 appropriated for rebuilding locks.
- 1854 Chapter 16 — \$5,000 appropriated for bottoming out canal.
Chapter 329 — \$101,000 appropriated for enlargement of canal.
Chapter 330 — \$100,000 appropriated for enlargement of canal for fiscal year beginning October 1.
Canal opened for enlarged beats, Montezuma to Ithaca.
Constitution, Art. VII, Sec. 3, — Legislature to appropriate annually for enlargement of canals; also authorizes the enlargement of Cayuga and Seneca canal.
Eight locks enlarged.
- 1855 Eleven locks enlarged.
- 1856 Chapter 148 — \$100,000 appropriated for fiscal year beginning October 1.
Work stopped for want of funds.
- 1857 Chapter 365 — \$212,119.42 appropriated.
Chapter 479 — Canal from Waterloo to Seneca lake to be deepened to 9 ft.
Dam and guard-gate at Seneca Falls completed.
Kingdon lock dispensed with.
- 1858 Chapter 329 — \$128,713.84 appropriated,—transferred from Erie fund.
Old lock between Seneca Falls and Waterloo removed.
\$324,836.44 needed to complete enlargement.
- 1859 Chapter 149 — \$66,615 to be raised by taxes for the enlargement of canal.
- 1860 Chapter 213 — \$188,714 appropriated.
- 1861 September 30, — 10.59 miles enlarged to 7 ft. of water.
- 1862 Chapter 137 — \$30,000 appropriated for completing enlargement.
Chapter 169 — All contracts to be closed September 1.
Chapter 466 — Bridge to be built at Evans St., Geneva.
September 1, — Enlargement complete, excepting part of section No. 7.
- 1863 Chapter 210 — Appropriation for completing certain improvements to Cayuga inlet,—pier dredging, etc.
Channel at foot of Seneca lake completed.
- 1864 Pier in Seneca river, near Chamberlain's dam, completed.
- 1866 Chapter 748 — Appropriation for dredging Cayuga inlet, to make 7 ft. depth, Owego St. to lake.
- 1867 Chapter 752 — Dam at Waterloo to be raised to original height.
Lock No. 6 rebuilt with rubble cement masonry.
- 1868 Chapter 329 — Bridge to be built over Seneca lake outlet.
Chapter 669 — Bridge to be built at Ovid St., Seneca Falls.
Chapter 715 — \$20,000 appropriated for pier at Geneva.

- 1869 Chapter 796 — Amends chapter 669-1868 concerning Ovid St. bridge, Seneca Falls.
Chapter 882 — \$15,000 appropriated for dredging Cayuga inlet and for building towing-path and pier at Ithaca.
Chapter 877 — \$7,000 additional appropriation for Ovid St. bridge, Seneca Falls.
10 locks, originally laid dry, to be laid in cement.
- 1870 Chapter 767 — Appropriation for improving berme bank at foot of Seneca lake.
Locks Nos. 2, 3, 9 and 11 rebuilt.
- 1871 Chapter 715 — Additional appropriation for improvements at Cayuga lake, pursuant to chapter 822-1869.
Chapter 915 — Swing-bridge to be built at State St., Ithaca.
- 1872 Chapter 343 — Appropriates \$2,000 for completion of improvements, pursuant to chapter 767-1870.
- 1873 Chapter 766 — Appropriates \$40,000 for Waterloo dam.
- 1874 Chapter 399 — Appropriation for dredging canal.
- 1875 Chapter 594 — Appropriation for vertical wall at Montezuma.
Stone abutments for Teal's bridge and repairing pier at Geneva, pursuant to chapter 766-1874, completed.
- 1876 Chapter 193 — Appropriation for removing bars and dredging channel, Cayuga inlet at Ithaca.
- 1884 April 12, — Part of State dam at Waterloo swept away by a freshet.
- 1887 Chapter 113 — Appropriation for improving locks Nos. 1 and 2, and dredging between Seneca lake and Waterloo.
- 1888 Chapter 291 — Swing-bridge to be built at Buffalo St., Ithaca. (Built 1889.)
Chapter 325 — Old Bear race at Waterloo to be improved.
Chapter 416 — Appropriation for general improvement of canal.
- 1889 Chapter 110 — Amending chapter 416-1888 concerning improvements to canal.
Chapter 150 — Appropriation for repairing second level and State ditch on the canal.
Chapter 493 — Appropriation for improvement of canal, pursuant to chapters 113-1887 and 325-1888.
Chapter 568 — Appropriation for improvement of canal.
February 11, — Work on Bear race stopped by injunction.
Piers at Ithaca and Geneva rebuilt.
- 1890 Chapter 168 — Appropriation for improvement of canal.
Lock No. 8 rebuilt.
- 1893 Chapter 683 — For reconstruction State pier at head of Cayuga lake.
- 1894 Chapter 279 — For removing obstructions in Cayuga lake.
Chapter 424 — For repairing berme bank and breakwater at Seneca lake.
Chapter 572 — For improvement of canal.
- 1895 Chapter 82 — For repairing and raising berme bank between Cayuga and Mud lock.
Chapter 142 — For protection of canal by repairs to berme bank and breakwater at foot of Seneca lake. (Completed 1897.)
Chapter 219 — Reappropriation for rebuilding pier at head of Cayuga lake, pursuant to chapter 683-1893.
Chapter 308 — For improvement of canal, by dredging.
Chapter 512 — For canal improvement at Waterloo.
- 1897 Chapter 572 — Reappropriates unexpended balance provided by chapter 512-1895.

- 1898 Chapter 606 — For protection of berme bank of canal at foot of Seneca lake, pursuant to chapter 142-1895.
Chapter 606 — Appropriates \$10,000 for removing bars and dredging branch to Cayuga lake.
Chapter 628 — For a bridge over canal at Seneca Falls.
- 1899 Chapter 224 — Amends chapter 628-1898 and makes appropriation for bridge over canal at Seneca Falls.
- 1900 Chapter 417 — Reappropriates unexpended balance for dredging, pursuant to chapter 606-1898, and makes additional appropriation.
Chapter 662 — Appropriates \$45,000 for extending towing-path from its terminus at Geneva 1,200 feet south to Long pier.
Chapter 680 — Appropriates \$97,000 for guard-lock and controlling-works in canal at Geneva.
- 1901 Chapter 645 — For repairing State pier, Cayuga lake, and for dredging inlet near Ithaca.
- 1902 Chapter 616 — Appropriates unexpended balance, pursuant to chapter 680-1900.
- 1903 January, — Guard-lock and controlling-works, provided by chapters 680-1900 and 616-1902, completed.
- 1904 Chapter 632 — Reappropriates unexpended balance for guard-lock, etc., pursuant to chapters 680-1900 and 616-1902.
- 1905 Chapter 722 — Unexpended balance of enlargement fund transferred to canal-debt sinking-fund.

CHEMUNG CANAL.

- 1779 Canal proposed by General Sullivan.
- 1815 Chapter 125 — Seneca and Susquehanna Lock Navigation Co. incorporated; \$300,000 capital stock.
- 1825 Chapter 236 — Surveys to be made from Seneca lake to Chemung river.
- 1826 Report of James Geddes for canal 31 miles long.
- 1829 Chapter 135 — Canal commissioners to build canal from Seneca lake to Elmira (after securing rights of Navigation Co.) for not over \$300,000.
- 1830 Contracts let for \$290,263 and work commenced, to be completed in October.
- 1831 Fifteen miles of canal completed.
Dam in Chemung river completed, 645x7 ft.
- 1832 Chapter 164 — \$16,000 appropriated for completion of the canal.
- 1833 Canal completed; 23 miles canal, Watkins to Elmira; 16 miles navigable feeder, Horseheads to Corning; 42 ft. surface, 4 ft. water; 53 locks 90x15 ft.; 516 ft. lockage.
May 5, 6, 7, — Heavy rains seriously damage canal and structures, especially Chemung dam.
October, — Navigation opened.
- 1837 Lock near Millport rebuilt.
- 1839 Chapter 306 — Survey to be made to connect Chemung and North Branch, Pa., canals.
The chute in Chemung feeder dam extended and reconstructed; cost \$10,578.42.
- 1840 Chapter 176 — Locks to be rebuilt for not over \$100,000.
Allen's report on extension to Tioga Point, 20 miles.
Contracts let for rebuilding locks.

- 1841 Chapter 219 — Commissioners to build canal from junction with inlet to Seneca lake.
- 1842 Chapter 34 — Funds to be raised for work under chapter 219-1841.
Chapter 114 — "Stop law," all work except necessary repairs stopped.
Canal extended 1.25 miles toward lake.
53 locks ordered rebuilt by chapter 176-1840 completed and brought into use.
- 1843 Spring floods considerably damage canal.
- 1844 Aqueduct across Catharine creek, near summit level, rebuilt.
- 1845 Pier built at Seneca lake, 220 ft.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Chapter 194 — Junction Canal Co. incorporated to connect Chemung and North Branch canals.
Chapter 325 — Wooden lock at Elmira to be rebuilt.
- 1847 Chapter 217 — Bridge to be built at Elmira, if necessary.
Lock at intersection of canal and Chemung river completed and brought into use.
- 1848 Chapter 218 — Canal to be built from junction with Catharine creek to Seneca lake.
- 1850 Canal to lake completed, pursuant to chapter 218-1848.
- 1852 Chapter 346 — Two bridges to be built at Elmira.
- 1854 Chapter 227 — Junction canal to be connected with Chemung.
Contracts let to keep canal in repair for five years.
- 1856 Estimate for Mud and Little lake reservoirs 313,196,400 cu. ft.; \$37,500.
- 1857 Chapter 175 — Bridge to be built at Horseheads.
June, — A series of freshets badly damage canal.
- 1858 Chapter 211 — Locks, when rebuilt, to be size of Erie canal.
Contracts let for repairing old locks.
Chemung and Junction canals connected.
- 1860 Locks Nos. 11, 21, 27, 31, 35, 37 and 41 rebuilt.
- 1861 Locks Nos. 19, 40, 43, 45, 46 and 48 rebuilt.
October 25, — Chemung river rises 14 ft. above normal height, 800 ft. towing-path bank swept away; navigation delayed 11 days.
- 1862 Chapter 130 — Trustees village Elmira may build bridges over canal at that place.
Canal board by resolution increases the draught allowed to boats from 3½ to 4 ft.
Locks Nos. 12, 14, 34, 38, 39, 42 and 44 on main canal and Nos. 50, 51, 52 and 53 on feeder rebuilt.
- 1863 Chapter 165 — Basin to be built on feeder at Corning; appropriation \$20,000.
Chapter 167 — Concerning certain bridges over canal at Elmira. (Completed 1864.)
- 1864 Chapter 200 — Draw-bridge to be built over canal at Cross St., Elmira.
Chapter 232 — Canal commissioners directed to build timber locks same size as Erie canal. (Nothing done.)
Chapter 470 — Draw-bridge (Snyder) to be built over canal at Second St., Elmira.
Chapter 471 — Lock at Elmira terminus of canal to be replaced by a culvert.

- 1865 Chapter 19 — \$20,000 appropriated for completion of Chemung canal feeder at Corning.
 Chapter 326 — Amends chapter 19-1865 and increases amount for completion of feeder to \$50,000.
 Chapter 416 — Draw-bridge to be built over canal at Fifth St., Elmira.
 Chapter 473 — Amends chapter 200-1864 concerning draw-bridge at Cross St., Elmira.
 March 16, 17, 18, — Freshet badly damages canal, especially State dam.
- 1866 Chapter 519 — Draw-bridge to be built at Watkins.
 Chapter 570 — Junction Canal Co. may build a railroad from Elmira to Athens, Pa.
 Locks Nos. 24, 25, 28 and 32 reconstructed; only three, Nos. 1, 36 and 40 of the old timber locks left.
- 1867 Chapter 579 — \$10,000 appropriated.
 Chapter 667 — Bridge to be built at Baldwin St., Elmira.
 June, — Freshet damages the canal.
 Locks Nos. 1, 36 and 40 rebuilt.
- 1868 Chapter 715 — \$30,000 appropriated for construction of a pier at Watkins.
- 1869 Chapter 877 — \$15,000 appropriated for dredging.
 Iron bridge with stone abutments authorized by chapter 667-1867 completed.
 Pier at Watkins completed.
- 1870 Chapter 578 — For construction of an iron bridge over canal feeder at Horseheads.
 Chapter 767 — Appropriates \$35,000 for several improvements to canal.
 April and June, — Dam at Gibson destroyed by floods.
- 1871 State dam, Gibson, destroyed in the spring of 1870, rebuilt.
- 1872 Chapter 785 — One mile of canal abandoned to Elmira for public street.
- 1873 August 11, — Severe rains carry away 5,000 cubic yards of towing-path near Gibson; navigation suspended 12 days.
- 1876 Chapter 382 — Commissioners appointed as to disposition to be made of canal.
- 1877 Chapter 404 — Canal to be abandoned at close of season of navigation, 1878.
- 1878 Chapter 171 — Transfers a part of canal to Elmira for use as a public street.
 Chapter 344 — Canal commissioners to sell the canal.
- 1879 Chapter 522 — Superintendent of Public Works to sell canal after January 1, 1880.
- 1880 November 12, — Canal from Elmira to Horseheads deeded to Canal R. R. Co. for \$600, pursuant to chapters 404-1877 and 344-1878.
- 1881 Chapter 157 — Sales of canal property to be advertised.
 Chapter 482 — Parts of abandoned canal released to certain parties.
 Chapter 593 — Sanitary condition of abandoned canal from Havana to Horseheads to be improved.
 Materials in locks, bridges, etc., sold for about \$2,200.
- 1884 Chapter 105 — Canal to be drained at Horseheads.
- 1885 Chapter 470 — Canal to be drained at Havana.
- 1886 Chapter 276 — Lock at Corning to be filled up.
 Chapter 440 — Slope wall to be completed at Corning.
- 1887 Chapter 169 — Seneca lake level reopened.
 Chapter 346 — Appropriation for completing slope wall on canal at Corning.

- 1888 Chapter 315 — Slope wall at Corning to be completed.
Chapter 416 — Opening of Seneca lake level to navigation.
- 1889 Chapter 382 — Appropriation for repairs to swing-bridge at Watkins. (Supplemented by funds from chapter 416-1889, new bridge was built.)
Chapter 467 — Reappropriation for sanitation of abandoned canal, pursuant to chapter 593-1881.
Chapter 568 — For construction of a basin at Havana, also opening Seneca lake level.
- 1890 Chapter 96 — Appropriation for sanitation of abandoned canal.
Chapter 338 — Reappropriates unexpended balance for opening Seneca lake level, pursuant to chapter 416-1888.
Swing-bridge at Watkins completed, pursuant to chapter 416-1889.
- 1891 Chapter 300 — For construction of slope wall on the abandoned canal at Corning.
Work of reopening lake level completed.
- 1892 Chapter 435 — State Engineer to prepare map of certain parts of abandoned canal.
- 1893 Chapter 726 — For abatement of nuisance caused by insufficient drainage of canal and canal feeder.
April 19, — State Engineer reports concerning maps, surveys, etc., of abandoned canal, pursuant to chapter 435-1892.
- 1894 Chapter 358 — For improving the sanitary condition of the canal.
Chapter 572 — For improving Seneca lake level of canal.
- 1895 Chapter 57 — For a bridge at Schuyler St., Havana. (Completed 1897.)
Chapter 463 — For draining abandoned canal at Montour Falls.
Chapter 679 — For constructing a sewer at Horseheads.
Chapter 932 — For repair of prism of abandoned canal.
- 1896 Chapter 482 — Reappropriation for improving Seneca lake level, pursuant to chapter 572-1894.
Chapter 801 — Amending chapter 482-1881.
- 1898 Chapter 624 — For reconstructing banks and channels Glen creek, Watkins, the same having been altered by State in building canal.
- 1899 Chapter 569 — Appropriation for draining abandoned canal at Montour Falls.
- 1901 Chapter 699 — Appropriation for improving the harbor at Watkins.
- 1903 Chapter 600 — For reconstructing slope wall, south side of feeder, abandoned canal at Corning.
- 1904 Chapter 729 — To abate the nuisance caused by the waters of the canal and feeder at Big Flats.
- 1905 Chapter 172 — Reappropriates unexpended balance for constructing slope wall at Corning, pursuant to chapter 600-1903.

CROOKED LAKE CANAL.

- 1809 Chapter 82 — Part of Crooked lake outlet declared a public highway.
- 1814 Surveyor-General to survey from Seneca lake to Cohocton river.
- 1824 Petition for survey of canal connecting Seneca and Crooked lakes and Cohocton river.
- 1827 Petitions presented to Legislature praying for the construction of Crooked Lake canal.
March 6, — Canal commissioners report against construction of Crooked lake canal.

- 1828 April 19, — Commissioners to make survey.
- 1829 Chapter 120 — Construction of canal authorized, not to exceed \$120,000. Report of David Thomas submitted; 8 miles; 29 locks; lockage, 270 feet.
- 1830 Hutchinson's report; estimate, \$119,198.
- 1831 Contracts for construction of canal let. Work begun.
- 1833 Chapter 115 — Authorizes canal board to allow for extra expense and labor.
May, — Floods cause considerable damage to unfinished work.
October 10, — Canal completed; 8 miles; 42 ft. surface, 4 ft. of water; 28 locks, 90x15 ft.
October 21, — Canal opened for navigation.
- 1834 Hutchinson's "Blue line" maps completed.
- 1835 Chapter 276 — Commissioners to deepen upper level 2½ ft. and reconstruct dam, if advisable.
- 1836 Chapter 216 — Authorizes canal commissioners to purchase water-privileges of Waggoner and Gillett.
- 1837 Dresden pier extended 215 feet.
- 1842 Chapter 114 — "Stop law," all work except necessary repairs stopped.
- 1844 Chapter 313 — Commissioners to make lake level same as Seneca lake,—1 foot lower.
- 1845 Chapter 338 — \$25,000 appropriated for reconstruction of locks.
- 1846 Chapter 325 — \$25,000 appropriated for reconstruction of locks.
Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Five locks rebuilt and brought into use, cost \$20,999.43.
- 1847 Chapter 249 — Commissioners to rebuild locks when necessary.
May 1, — Eleven locks completed and brought into use.
- 1848 May 8, — All locks completed and brought into use.
- 1849 Chapter 218 — Seneca lake lock to be rebuilt of stone.
- 1851 Pier at Dresden completed.
- 1853 Chapter 620 — \$5,000 appropriated for improving Crooked lake level.
- 1855 Chapter 570 — \$3,500 appropriated for completing improvement of Crooked lake level.
Contracts let to keep canal in repair for five years.
- 1857 June 9, 17, 25, 30, — A series of freshets badly damages canal.
- 1859 Chapter 449 — Appropriation for improving the upper level of canal.
- 1861 Bridges and retaining wall at Penn Yan completed.
- 1863 New guard-lock constructed of stone at Penn Yan, 18 inches lower than old lock.
July, — Canal badly damaged by severe storm.
- 1864 Penn Yan level lowered to conform to guard-lock.
- 1867 Chapter 579 — \$25,000 appropriated for rebuilding locks.
June, — Freshet considerably damages canal.
- 1868 Chapter 715 — \$40,000 appropriated for rebuilding 5 locks of stone.
- 1869 Four locks reconstructed, cost \$36,786.26.

- 1870 Chapter 767 — Appropriation for improvement at Penn Yan. Locks Nos. 8, 9, 10, 11, 18 and 19 to be rebuilt.
- 1871 Six locks rebuilt at an average cost of \$10,000 each.
- 1872 Chapter 343 — Appropriation of \$3,000 for brush and stone protection to the locks and banks.
Only about two feet of water in canal for six months.
- 1875 Chapter 499 — Canal board to examine and report as to sale of canal.
- 1876 Chapter 382 — Commission appointed to report what disposition should be made of canal.
Canal not in operation.
- 1877 Chapter 404 — Canal to be abandoned after passage of this act. (June 4, 1877.)
January 3, — Canal transferred from middle to western division.
- 1878 Chapter 143 — Banks and prism of canal to be released to Penn Yan and New York R. R. Co. for \$100.
Chapter 344 — Canal commissioners to sell the canal.
- 1879 Chapter 522 — Superintendent of Public Works to sell the canal.
- 1881 Chapter 157 — Sales of canal property to be advertised.
- 1882 Chapter 34 — Time for completion Penn Yan R. R. extended and release confirmed.
- 1884 Chapter 471 — Time for completion Penn Yan R. R. extended five years and release confirmed.
- 1887 Chapter 234 — Appropriation for improvement of Crooked lake outlet.
- 1888 Outlet improved and bar at Branchport partly removed.
- 1889 Chapter 570 — Appropriation for completion of improvements to outlet, pursuant to chapters 234-1887, and 206 and 389-1888.

ONEIDA LAKE CANAL.

- 1827 Petitions to Legislature for the construction of Oneida Lake canal.
- 1831 Petition to Legislature for the incorporation of a company to build a canal from Erie canal to Oneida lake.
- 1832 Chapter 53 — Oneida Lake Canal Co. incorporated to build canal from Erie canal to Oneida lake, capital stock \$40,000.
- 1835 Chapter 70, — Amount of capital increased by \$30,000.
Canal completed 6.5 miles; 7 locks, 1 guard-lock, 40 ft. surface, 26 ft. bottom, 4 ft. water; cost \$78,825.
September 12, — Navigation opened.
- 1836 Chapter 534 — Canal to be extended 4 miles up Fish creek.
- 1840 Chapter 258 — Canal to be purchased by State for not over \$50,000.
- 1841 Canal transferred to State for \$50,000.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
New towing-path built along Wood creek, one mile long.
- 1847 Feeder made navigable for boats of 3 feet draught; Erie canal to Oneida depot.
Towing-path along Wood creek destroyed by floods.

- 1849 Chapter 425 — Additional land to be purchased and towing-path to be built on Wood creek.
- 1855 Contracts let to keep canal in repair for 5 years.
- 1860 Chapter 46 — When rebuilt, locks to be same size as on enlarged Erie canal.
- 1862 Chapter 486 — Commissioners to present comparative estimates for rebuilding locks of existing and enlarged dimensions; locks to be repaired as long as possible.
- 1863 Contracts let for rebuilding locks.
Report to Senate by canal board, recommending new route, from Durhamville to South Bay, 5.3 miles.
Contractors on locks abandon work.
Navigation suspended entire season, owing to uselessness of old locks and preparations for rebuilding new ones; never again opened on this route.
- 1865 Chapter 626 — Canal board to settle with contractors for rebuilding locks.
- 1867 Chapter 934 — Canal contracting board may rebuild locks or build canal in new location; \$346,153.47 appropriated.
December 18, — New canal placed under contract.
- 1868 Moneys appropriated under chapter 934-1867 to be paid into State treasury.
- 1869 Chapter 815 — Reappropriates \$264,498.26 for building canal.
Chapter 918 — Authorizes canal board to make supplementary contracts.
December, — Supplementary contracts made.
- 1870 Chapter 787 — Canal commissioners to allow contractors building locks their actual cost, where bids were less.
June, — Second supplementary contracts made for locks.
Work suspended; funds exhausted; one section completed, remainder $\frac{1}{2}$ done, locks nearly finished.
- 1871 Chapter 980 — Appropriation to continue enlargement.
- 1872 Chapter 700 — Appropriation for payment of labor performed and not paid for.
Chapter 850 — Appropriates \$50,000 to complete enlargement. (Nothing done till 1874.)
- 1873 Chapter 766 — Additional appropriation of \$25,000 for completion.
February 4, — Report of canal commissioners, responding to legislative inquiry concerning canal finances, time of completion, etc.
December 19, — New contracts let; to be completed January 1, 1875.
- 1874 June, — Work again commenced.
- 1875 Chapter 594 — Appropriation to complete canal.
January, — Work again suspended.
- 1877 Chapter 301 — Reappropriates unexpended balances to complete canal, if canal board approves.
September, — Canal completed.
October 6, — Navigation opened.
October, — Two breaks, latter closes canal for rest of season.
- 1878 Canal open after July 1; serious break; canal open again till close of season; not open after this year.
- 1879 Superintendent of Public Works advises abandonment of the canal.
- 1883 Chapter 495 — Oneida Lake canal fund appropriation.
- 1887 Chapter 428 — Lands taken for New Oneida Lake canal released to parties from whom acquired.
Canal officially abandoned.

- 1839 Chapter 570 — Appropriation for constructing and repairing road crossings.
- 1894 Chapter 198 — Interest to be allowed claimants on awards for damages caused by construction of canal.
- 1897 Chapter 566 — For a steel swing-bridge over canal at Higginsville. (Completed 1898.)

CHENANGO CANAL.

- 1803 Chapter 102 — Chenango river declared a public highway.
- 1824 Petition presented, praying for construction of Chenango canal.
- 1825 Chapter 236 — Canal commissioners to survey for canal from Chenango Point up Chenango river to Erie canal.
Geddes' survey; 90 miles; lockage, 1,050 ft.; estimated cost, \$715,478.
- 1826 Canal committee report in favor of construction of Chenango canal.
- 1828 Hutchinson's survey; 92.775 miles; summit 706 ft. above Erie.
- 1829 Chapter 72 — Commissioners to build canal, Binghamton to Utica, upon satisfactory examinations concerning water-supply, cost and revenue.
- 1830 Bates' report presented; 95 miles; 114 locks, lockage 1,009 ft.; estimated cost, \$992,307.
- 1833 Chapter 32 — Canal to be built from Binghamton to Erie, for not over \$1,000,000.
John B. Jervis appointed chief engineer.
Contracts let on northern portion.
- 1834 Chapter 46 — Northern terminus changed from Whitesboro to Utica.
Construction commenced.
- 1835 Chapter 182 — \$860,000 to be borrowed.
- 1836 Chapter 464 — Commissioners to borrow \$260,000.
October, — Canal completed.
- 1837 Chapter 27 — Commissioners to borrow \$150,000.
Navigation commenced.
- 1838 Chapter 13 — Commissioners to borrow \$32,535.66.
Chapter 54 — Commissioners to borrow \$3,552.08.
Chapter 89 — Commissioners to borrow \$10,000.
Chapter 143 — Commissioners to borrow \$50,000.
- 1839 Chapter 262 — Tolls to be same as on Erie canal.
Chapter 386 — Commissioners to borrow \$20,000.
- 1840 Chapter 224 — Commissioners to borrow \$20,000 for damages.
- 1842 Freshet causes \$6,000 damage to canal.
- 1843 Kingsley brook reservoir destroyed by heavy rains and melting snows.
- 1846 Chapter 98 — Allows State Lunatic Asylum at Utica certain privileges of using surplus waters.
Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
- 1849 Stone dam built on West branch feeder.
New iron bridge built at Binghamton.
- 1850 Aqueduct at Greene rebuilt.
- 1852 Chapter 359 — Bridge to be built at Garden St., Utica.
Page's brook aqueduct rebuilt.

- 1854 New aqueduct built at Crandalls.
- 1855 Contracts let to keep canal in repair for 5 years.
- 1857 Contract on one section annulled.
- 1859 Chapter 457 — Amending act permitting State Lunatic Asylum to take its water-supply from canal.
Chapter 501 — Authorizes the laying of a horse-car railroad track on berme bank of canal.
Contract let to keep section 3 in repair for 3 years.
- 1861 Contracts on sections 1 and 3 annulled and relet.
Iron bridge built at Utica and one at Norwich.
- 1862 Chapter 115 — Amends chapter 359-1852, concerning Garden St. bridge at Utica.
Lock No. 89 rebuilt of rubble masonry and oak fenders.
- 1863 116 locks on canal, over 100 of which are in bad condition.
- 1864 Locks Nos. 86, 87, 89, 104 and 109 rebuilt.
Restoration of Kingsley brook reservoir begun.
- 1865 Chapter 669 — Bonus to insure speedy completion of certain locks.
Lockages between sundown and sunrise prohibited on canal.
March 16, 17 and 18, — Freshet seriously damages canal, also Oxford and Stratton feeder dams.
Locks Nos. 100 and 103 rebuilt.
- 1866 Chapter 649 — Locks, when rebuilt, to be same size as North Branch, Pennsylvania canal, 91x16½ ft.
- 1867 Chapter 801 — Bridge to be built at College St., Clinton.
Chapter 564 — Asylum to control levels from 5th lock to 10th lock.
Chapter 606 — Bridge to be built at Water St., Clinton.
Chapter 692 — Bridge to be built at Lebanon St., Hamilton.
Locks Nos. 56, 60, 61, 77, 78 and 79 rebuilt.
May 23, — Break near Norwich, navigation delayed eight days.
Kingsley brook reservoir completed.
- 1868 Chapter 418 — Bridge to be built over canal at Eaton St., Hamilton.
Chapter 421 — Swing-bridges to be built over canal at Henry and Hawley Sts., Binghamton.
Chapter 425 — Bridge to be built over canal at Genesee St., Greene.
Locks Nos. 52, 55, 65, 80 and 81 rebuilt.
- 1869 Chapter 40 — Turntable bridge to be built over canal at Norwich.
Chapter 877 — Additional appropriation for turntable bridge at Norwich.
July, — Capron aqueduct badly damaged by high water in Sauquoit creek.
- 1870 Chapter 153 — For the construction of an iron bridge at Court St., Binghamton.
Chapter 767 — For completion of three locks being built and other improvements.
Capron aqueduct rebuilt and an additional span added.
Locks Nos. 18, 19 and 22 rebuilt.
- 1871 Chapter 778 — Appropriation for improving Madison brook reservoir.
Chapter 930 — Appropriations for bridges at Norwich, Bouckville, Sherburne, Hamilton and Binghamton.
- 1872 Chapter 787 — Canal from Prospect Ave., to Susquehanna St., Binghamton, abandoned to city for street purposes.
Chapter 850 — Appropriation for rebuilding locks Nos. 7 and 9.
Locks Nos. 7, 17, 27, 47, 51, 101, 107, 108 and 110 rebuilt.
Fifty locks require rebuilding.

- 1873 Chapter 711 — Binghamton authorized to declare part of canal a public street, under chapter 787-1872.
- 1874 Canal to be built in charge of one superintendent.
- 1875 Chapter 499 — Canal board to examine and report as to sale of canal.
- 1876 Chapter 382 — Commission appointed to report what disposition should be made of canal.
- 1877 Chapter 404 — Canal south of Hamilton, also the canal extension, to be abandoned on and after May 1, 1878, reservoirs and feeders north of Hamilton reserved.
January 19, — Commission under chapter 382-1876 advise that canal portions useful as feeders and useful for Utica Asylum be retained, remainder sold.
- 1878 Chapter 391 — Canal within the limits of Binghamton ceded to the city for a public street.
Chapter 344 — Canal commissioners to sell the canal.
- 1879 Chapter 522 — Superintendent of Public Works to sell canal after January 1, 1880.
- 1880 Chapter 190 — Amending chapter 391-1878, empowering Binghamton to summarily remove encroachments.
Chapter 551 — State's interests in canal lands and water-privileges south of Hamilton, released to adjoining owners; in Norwich, Oxford and Greene, to villages for public use.
- 1881 Chapter 157 — Sales of canal property to be advertised.
Chapter 314 — Stone from locks given to the Historical Society for construction of a monument to General Herkimer and the heroes of Oriskany.
Chapter 489 — Canal south of Hamilton released to adjoining land owners to center of canal, also canal extension.
- 1882 Chapter 49 — Material of structures on abandoned canal to be sold at auction.
- 1883 Chapter 450 — Canal in Utica may be leased to owners of adjoining land.
- 1884 Chapter 98 — Canal bank from lock 59 to lock 53 released to Utica, Clinton and Binghamton R. R. Co.
Chapter 355 — Iron canal bridge at Utica to be removed to Rome and laid across Black River canal.
Chapter 382 — Canal north of Hamilton to lock 79 released to village, including reservoir at Woodman's pond.
Chapter 482 — Bridges at Columbia and Fayette Sts., Utica, to be rebuilt.
- 1885 Chapter 80 — Bridges at Columbia and Fayette Sts., Utica, to be lowered or replaced by culverts.
Work completed on Columbia and Fayette St. bridges.
- 1887 Chapter 456 — Utica to fill up abandoned canal south of Canal St., and to sell the lands for payment.
Chapter 588 — Abandoned canal released to adjoining owners with some reservations.
- 1888 Chapter 23 — Amends chapter 588-1887.
Chapter 375 — Embankment at Mad brook, Sherburne, to be repaired.
- 1889 Chapter 155 — Concerning the repairing of canal embankment at Sherburne.
- 1890 Chapter 253 — Appropriates partial reimbursement to the town of Madison for damages caused by abandonment of canal.
- 1892 Chapter 249 — Amending chapter 375-1888, provides for repairs of State embankment at Sherburne.

- 1894 Chapter 570 — For repairing certain structures and clearing summit level and feeders.

BLACK RIVER CANAL.

- 1810 Chapter 181 — Black River Navigation Co., incorporated to improve Black river, Brownville to Lake Ontario, in 3 years.
- 1811 Chapter 85 — Improvement to be done in 3 years.
- 1812 Chapter 234 — Improvement to be done in 4 years.
- 1815 Chapter 218 — Improvement to be done in 3 years.
- 1816 Chapter 236 — Improvement to be done in 2 years.
- 1825 Chapter 236 — Canal commissioners to survey from Rome to Ogdensburg via Black river.
- 1826 Report of James Geddes; survey covers 3 routes, from Herkimer, Boonville and Fort Bull, all terminating at Ogdensburg.
- 1828 Chapter 87 — Black River Canal Co. incorporated to build canal, Rome to High falls and to improve the river to Carthage in 3 years.
Chapter 225 — Jefferson County Canal Co., incorporated to build canal from Long falls to Sacketts Harbor in 5 years.
Cruger's survey for Black River Co.; 34 miles canal, 11 miles feeder, 40 miles river navigation, lockage 1,090 ft.; estimate based on canal 32 and 20 by 4 ft. locks 75 ft. long, 7½ ft. wide, \$437,738.25.
- 1829 March 24 — Canal commissioners to make survey. (Failed to do so.)
- 1830 Chapter 114 — Commissioners again ordered to make survey.
- 1831 Holmes Hutchinson's report on canal with feeder, inclined planes and locks; report based on a canal same size as Cruger's, excepting locks to be 10 ft. wide.
- 1832 Chapter 174 — Black River Company incorporated, to build canal or railroad; capital stock \$900,000.
- 1834 Chapter 139 — Canal commissioners to survey for river improvement and canal.
- 1835 T. B. Jervis reports for a canal 26 ft. wide, 4 ft. deep, with banks 7 ft. high, with or without inclined planes.
- 1836 Chapter 157 — Canal commissioners to construct canal and feeder, and improve river.
Portous R. Root appointed chief engineer.
- 1837 Surveys completed.
November 11, — First 14 miles located and put under contract.
- 1838 Contracts let from Lansing kill to High falls, also for feeder; river work begun.
- 1839 Chapter 321 — Canal commissioners to survey for extension from Carthage to Lake Ontario and St. Lawrence river.
- 1840 Chapter 161 — Commissioners to borrow \$250,000.
Report on extension by E. H. Broadhead, pursuant to chapter 321-1839.
Lansing kill aqueduct completed.
- 1841 Chapter 194 — Commissioners to borrow \$300,000.
Contracts let for dam on Black river, guard-lock and sluice and portion of feeder to connect same.

- 1842 Chapter 114 — "Stop law," all work except necessary repairs stopped.
11,500 cu. ft. per minute available as feeder to Erie canal.
- 1844 Chapter 278 — Commissioners to sell canal materials and use proceeds in completing and preserving specified work.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Chapter 246 — \$2,500 appropriated for preservation of canal.
- 1847 Chapter 260 — \$100,000 appropriated for Black River canal and Erie feeder.
Chapter 447 — \$50,000 additional appropriation for Black River canal and Erie feeder.
July 21, — Contracts let to complete feeder (except section 2), dam, bridges, etc.
September 10, — Contracts let for lock work near summit.
- 1848 Chapter 214 — \$130,000 appropriated for Black River canal and Erie feeder.
Black River feeder completed, 4 ft. deep; designed for 16,000 cu. ft. water per minute.
October 18, — Water first turned into feeder.
Dam completed for Forestport pond.
Contracts let from Boonville to Port Leyden.
- 1849 Chapter 216 — \$130,000 appropriated for canal and \$10,000 for improvement of river to Carthage.
Chapter 219 — \$50,000 appropriation of chapter 260-1847 reappropriated.
June 28, — Water turned in, to supply Erie canal.
November, — Canal filled for 25 miles, Rome to Boonville.
Surveys made of Woodhull and Wolf lakes.
Temporary dam built at Woodhull and Wolf lakes.
- 1850 Chapter 220 — \$120,000 appropriated.
May 10, — First boats passed from Rome.
Contracts let from Port Leyden to High falls.
November 1, — Canal north of Boonville to Port Leyden completed and water let in.
- 1851 Chapter 181 — Suitable reservoirs to be built.
Chapter 485 — Balance of revenue to be applied to completion by "canal-revenue-certificate" plan.
Canal, Rome to Port Leyden, in use during season.
Contracts let to build sluices around locks, also feeder from Mohawk at Delta.
Surveys made for 4 reservoirs and 42½ miles Black river improvement.
Plans adopted for 4 reservoirs, 1,848,308,640 cu. ft.
- 1852 Court of Appeals declares chapter 485-1851 unconstitutional.
- 1853 Chapter 166 — Bridge to be built over river at Carthage.
Chapter 620 — \$75,000 appropriation.
Contracts let for Woodhull and North Branch reservoirs.
- 1854 Constitution, Art. VII, Sec. 3, — Legislature to appropriate annually for enlargement of canals.
Chapter 330 — \$49,000 appropriation for fiscal year.
Dams built at Carthage and Lyons Falls.
Locks Nos. 108 and 109 completed.
- 1855 Contracts let to keep canal in repair for 5 years.
Contracts let for reservoirs at South Branch and Chub lakes.
November 13, -- 2.7 miles of canal north of Port Leyden and 13 locks completed, finishing entire canal, exclusive of river improvement.

- 1856 Chapter 148 — \$50,000 appropriated for fiscal year.
North Branch reservoir completed, capacity 423 acres, 309,934,400 cu. ft.
November 12, — Work stopped on other reservoirs and on river.
- 1857 Chapter 365 — \$130,861.06 appropriated.
Chapter 428 — Bridge at Tiffany's to have a draw.
September 3, — Plan abandoned of improving river by jetty dams and piers.
- 1858 Chapter 329 — \$76,261.17 appropriated from Erie canal.
- 1859 Chapter 149 — \$49,780 appropriated for completing Black River canal, reservoirs and improvement of river .
Chapter 326 — \$56,838.91 reappropriated for completing Black River canal; all reservoirs and river improvement made part of section 2, Black River canal.
Woodhull and South Branch reservoirs put under contract.
Guard-lock at head of Delta feeder completed.
June 18, — Contracts let for lock and dam at Otter creek, under new plans for river improvement.
October 10, — Contracts let for river improvement, Lyons Falls to Carthage, 60 ft. channel, 5 ft. water, also for Carthage dam.
- 1860 Chapter 213 — \$75,619 appropriated.
Woodhull reservoir completed, 1,236 acres, 780,943,680 cu. ft.
South Branch reservoir completed, 518 acres.
Delta feeder completed.
- 1861 Lock and dam at Otter creek finished and river navigation opened; 22½ miles slack-water navigation, Carthage to Beach's bridge; 10 miles dredged to Otter creek; 10 miles slack water to Lyons Falls.
July 2, — Serious break caused by heavy rains; repaired by excavating 300 ft. of new channel.
- 1862 Chapter 137 — \$20,000 reappropriated for completion of canal and river improvement; also completion of reservoir and bridges.
Chapter 169 — All contracts to be closed September 1.
- 1863 Canal commissioners urge completion of Chub lake reservoir, on which work was abandoned in 1856.
Pier to be built at Otter creek to protect the lock from debris brought down by the stream.
- 1864 Chapter 151 — \$24,298.51 appropriated for lock and dam to be built between Otter creek and Carthage. (Completed 1869.)
Chapter 174 — Commissioners to rebuild bridge over Black river at Lyons Falls. (Built 1865.)
Chapter 472 — Bridge to be built at North St., Port Leyden.
Tolls to be collected on Moose river.
- 1865 Chapter 703 — Additional appropriation, \$35,000 for lock and dam between Otter creek and Carthage, pursuant to chapter 151-1864.
Site selected for lock and dam between Otter creek and Carthage at a point three miles above Beach's bridge; contract let.
- 1866 Chapter 543 — \$19,401.96 reappropriated from chapter 151-1864.
Chapter 602 — State to maintain bridges at Illingsworth and Beach's.
- 1867 Chapter 579 — Canal to be enlarged, deepened and widened from its junction with Erie at Rome to lock No. 1.
- 1868 Chapter 346 — \$17,245.46 reappropriated from chapter 543-1866.
Chapter 519 — Bridge to be built over canal at Main St., Port Leyden. (Built 1869.)

- 1869 Chapter 598 — Authorizes board of canal appraisers to hear and determine claims for damages in connection with the break at North lake reservoir.
Chapter 867 — Beach's bridge and Illingsworth bridge to be repaired and, when necessary, rebuilt.
Chapter 868 — Bridge to be built over Beaver river.
Chapter 877 — Iron bridge to be built at Floyd St., Rome.
Lock and dam above Beach's bridge completed.
April 21, — Break in dam of North lake reservoir inundates surrounding country, causing enormous damage.
- 1870 Chapter 767 — Appropriation for bridge over Beaver river.
First level at Rome improved to size of Erie.
North Branch reservoir, washed out in 1869, reconstructed; cost, \$97,033.81.
- 1871 Chapter 930 — Appropriation for balance on enlarging first level and building bridge at Floyd St., Rome.
Cast iron discharge pipes inserted in Woodhull reservoir and the reservoir put in thorough repair.
- 1872 Chapter 850 — Dam to be built in Moose river at Old Forge, pursuant to chapter 181-1851.
August 6, — Canal board resolves that it is expedient to build Moose river dam at Old Forge.
Sand lake reservoir completed; capacity, 200,000,000 gallons; can be filled twice per year.
- 1873 Chapter 643 — Appropriation for canal improvements, pursuant to chapters 767-1870 and 930-1871.
- 1874 February 1, — The three sections of the canal consolidated.
- 1875 Chapter 499 — Canal board to examine and to report as to sale of canal.
- 1876 Chapter 382 — Commission appointed to report as to what disposition should be made of canal.
January 13, — Canal Commissioner Thayer and State Engineer Sweet report against abandonment or sale of canal.
January 27, — Black River canal placed in the middle division.
- 1877 January, — Commission under chapter 382-1876 reports that the canal should be kept open and maintained intact.
All locks from No. 1 to No. 109, inclusive, repaired.
- 1880 Surveys of Canachagala, Twin and White lakes.
Dam built at second Bisby.
- 1881 Chapter 336 — Reservoirs to be built on Independence and Beaver rivers.
Canachagala, Bisby, White and Twin lake reservoirs completed; also Fulton chain, a series of 6 reservoirs.
- 1882 Constitution, Art. VII, Sec. 6, — Prohibits lease or sale of canal.
- 1883 Chapter 452 — Appropriation to construct reservoir above Forestport reservoir.
Chapter 495 — Black River canal fund appropriation.
Examination made for Beaver river reservoir site, — Stillwater selected.
Plans prepared for Forestport reservoir.
- 1884 Chapter 355 — Iron canal bridge across Chenango canal at Utica to be removed and laid across Black River canal at Rome.
June 8, — The wooden spillway at Lyons Falls washed away and rendered a total wreck.
Work on dam at second Forestport reservoir commenced.
- 1885 Chapter 253 — Appropriation for building a towing-path on south bank of Beaver river in town of New Bremen.
Work begun on Stillwater dam, Beaver river.

- 1886 Chapter 550 — Wall to be built at Lock St., Rome.
Dam at Stillwater, Beaver river, completed; 9 ft. 6 in. above low water, 150 ft. spillway; 828,000,000 cu. ft.
January 5, — The south abutment and 90 ft. of the dam and apron at the head of the Delta feeder washed away by a freshet.
- 1887 Chapter 113 — Appropriation for general improvement of canal.
Lock No. 29 rebuilt.
- 1888 Chapter 270 — Appropriation for construction of vertical wall at Rome.
Chapter 416 — Appropriation for improvement of locks.
Locks Nos. 8 and 48 rebuilt.
- 1889 Chapter 54 — Additional appropriation to chapter 113-1887, for improvement of canal.
Chapter 274 — Additional appropriation for completion of Forestport reservoir, pursuant to chapter 452-1883.
Chapter 493 — Appropriation for general improvement of canal.
Chapter 568 — Appropriation of \$16,000 for general improvement of canal.
Lock No. 60 rebuilt.
- 1890 Chapter 168 — Appropriation of \$10,000 for general improvement of canal.
Chapter 338 — Reappropriates unexpended balance for canal improvement, pursuant to chapter 416-1888.
Lock No. 12 rebuilt.
- 1891 Chapter 143 — Appropriates \$5,000 in addition to the \$10,000 appropriated by chapter 168-1890, for improvement of canal.
Chapter 342 — Flow ground of Forestport reservoir to be cleared.
Lock No. 1 rebuilt.
- 1892 Chapter 271 — For constructing a stone wall on west side of canal at Rome.
Chapter 469 — For enlargement and reconstruction of the dam on Beaver river. (Completed 1894.)
Chapter 494 — Appropriates \$35,000 for completing Forestport dam and reservoir. (Completed 1893.)
July, — Contract let for completing Forestport dam.
September 6, — Contract let to raise Stillwater dam five feet.
- 1893 Chapter 395 — For rebuilding bridge over the canal connecting Carthage and West Carthage.
December, — Forestport dam completed.
- 1894 Chapter 572 — \$55,000 appropriated for general improvement of canal.
Claim filed by N. Y. C. R. R. Co. for damages to embankment by Forestport reservoir.
Lock No. 76 rebuilt.
- 1895 Chapter 102 — For a bridge over canal between Carthage and West Carthage. (Completed 1896.)
Chapter 965 — For a swing or draw-bridge over canal at Garden St., Rome. (Completed 1896.)
Chapter 970 — For an iron bridge over canal at Thomas St., Rome. (Completed 1896.)
Chapter 1030 — For repairing locks on canal.
Locks Nos. 18, 28 and 37 rebuilt.
- 1896 Locks Nos. 39, 40 and 41 rebuilt.
- 1897 Chapter 572 — Reappropriation to pay balance provided by chapter 102-1895 for a bridge over canal between Carthage and West Carthage.
July 23, — Break 400 ft. long and 50 ft. deep in bank near Forestport; repairs cost \$62,781.78; navigation suspended 30 days.
Locks Nos. 49 and 96 rebuilt.

- 1898 Chapter 606 — Appropriates balance due on bridge over canal at Garden St., Rome, pursuant to chapter 965-1895.
Report of D. E. Whitford on water-supply from Adirondack forest.
May 23. — Bad break on canal feeder near Forestport; navigation suspended 21 days; caused maliciously; cost of repairs, \$50,764.47.
Locks Nos. 51 and 55 rebuilt.
- 1899 September 18. — Third break, caused maliciously, in Forestport feeder bank; navigation suspended 17 days; cost of repairs, \$17,089.72.
- 1900 Chapter 428 — Supplements chapter 469-1892, concerning the restoration of water diverted for canal use to owners of water-power on Black river; new dam to be built on Beaver river.
Locks Nos. 47 and 64 rebuilt.
Canal between Boonville and Lyons Falls recommended to be abandoned.
- 1902 May. — Judgment in favor of N. Y. C. R. R. Co.; State to pay \$13,927.35 or \$61,207.99 and give company privilege to extend its embankment into reservoir.
Chapter 420 — \$45,000 appropriated to replace Forestport lower dam by concrete structure.
- 1903 July 28. — Break in berme bank near lock No. 13; navigation interrupted 11 days.
Concrete dam on Beaver river completed.
New concrete dam completed at Forestport.
- 1904 Bridges 4, 11 and 9 replaced by new structures.
State consent given railroad to construct embankment as specified in decision rendered by Court of Claims in 1902.
- 1905 Chapter 722 — Unexpended balance of fund for completion of canal transferred to canal-debt sinking fund.
Governor recommends abandonment of section 2, Black River canal.

GENESEE VALLEY CANAL.

- 1813 Chapter 47 — Genesee river declared a public highway.
- 1823 Petition for \$10,000 for improvement of Genesee river.
- 1825 Chapter 236 — Commissioners to survey for canal, three routes—Rochester to Olean, Scottsville to Genesee river, Lake Erie to Allegheny river.
- 1826 Commissioners report favorable routes.
- 1830 Chapter 234 — \$750 appropriated to survey Genesee valley route. (Nothing done.)
- 1834 Chapter 215 — Commissioners to survey Genesee valley route; also side-cut Mount Morris to Dansville.
- 1835 Report of F. C. Mills presented.
- 1836 Chapter 257 — Commissioners to build canal, Rochester to Olean, and side-cut to Dansville.
- 1837 June. — Contracts let for first division south of Rochester.
Report on feeder from Conesus lake.
Preliminary surveys for the entire line completed.
- 1838 Work from Rochester to rapids completed.
Work in progress on 51 miles more,—rapids to Dansville.
Route adopted and 50 miles, Mount Morris to Cuba, let by contract.
Genesee river feeder enlargement completed.

- 1839 Chapter 305 — Commissioners to use cheaper locks, saving \$384,506.95.
Commissioners report: Oil creek reservoir to be 490 acres, dam 55 ft. high, 390,000,000 cu. ft.; Rockville reservoir begun, 18,000,000 cu. ft.; Ischua creek reservoir to be 575 acres, dam 70 ft. high, 588,000,000 cu. ft. Contracts let for remaining twenty miles.
Aqueduct at Mount Morris dispensed with.
- 1840 Chapter 161 — \$500,000 authorized to carry on work.
September 1, — Navigation opened, Rochester to Mount Morris, 36 miles. Collector's office established at Scottsville.
Break at Black creek; 15,000 cu. yds. earth carried out; navigation interrupted eight days.
- 1841 Chapter 194 — Commissioners to borrow \$550,000.
November 23, — Navigation opened from Mount Morris to Shaker settlement, 5.22 miles; thence to Dansville, 11.12 miles; 52 miles of completed navigable waterway to date.
Rockville reservoir completed.
- 1842 Chapter 144 — "Stop law," all works except necessary repairs stopped.
- 1844 Slip from Dansville to side-cut connected by citizens of Dansville.
- 1845 Bradner's creek taken as a feeder.
- 1846 Constitution, Art. VII, Sec. 6, — Canals never to be sold, leased or otherwise disposed of.
Chapter 241 — Bridge to be built at Clay St., Rochester.
Chapter 246 — \$10,000 appropriated for preservation of canal.
Chapter 305 — Canal board to receive Dansville slip and basin.
- 1847 Chapter 263 — \$128,000 appropriated for constructing canal.
Chapter 446 — \$50,000 appropriated for constructing canal.
Contracts let for finishing "Deep Cut" and Portage tunnel, 1,082 feet long.
- 1848 Chapter 172 — Canal board to assume Dansville slip and basin.
Chapter 217 — \$218,000 appropriated for work between Mount Morris and Caneadea.
Chapter 339 — Reservoir to be built at Conesus lake.
Portage tunnel abandoned; new contract let for open cut.
- 1849 Chapter 222 — Lakes Conesus, Caneadea, Honeoye and Hemlock to be used for canal purposes.
Chapter 227 — Balance of \$128,000, provided by chapter 263-1847, reappropriated.
Chapter 229 — \$140,000 appropriated.
Locks from Mount Morris to Caneadea to be of wood.
- 1850 Chapter 192 — \$170,000 appropriated.
Portage aqueduct and open cut completed.
- 1851 Chapter 485 — Surplus revenues to be applied to completion by "canal-revenue-certificate" plan.
Canal from Shaker settlement to feeder near Ronnesville, 36 miles, opened.
Dansville slip and basin assumed by State.
- 1852 Contracts let, pursuant to chapter 485-1851.
Thirty-seven locks completed during year.
Mount Morris dam completed, 337 feet long, 25 feet high, cost \$45,000.
Wiscoy aqueduct completed.
Court of Appeals declares chapter 485-1851 unconstitutional.
- 1853 Chapter 620 — \$100,000 appropriated.
Eighty-three locks completed.

- 1854 Chapter 329 — \$65,000 appropriated for completing canal.
 Chapter 330 — \$66,000 appropriated for completing canal after October 1.
 Chapter 331 — Survey to be made for navigable feeder to Wellsville, 19 miles.
 Constitution, Art. VII, Sec. 3. — Canal to be completed.
 Navigation extended 4.5 miles to Rockville, making 93 miles.
 Rockville reservoir repaired.
- 1855 Wellsville feeder reported unfavorably.
 New aqueduct built at Shakers and Scottsville.
 Contracts let for repairs for five years from February 1, 1856.
 August. — Rockville reservoir badly damaged by heavy rains; lets water into canal and seriously injures same.
- 1856 Chapter 148 — \$32,000 appropriated for fiscal year.
 Chapter 149 — Survey ordered for extension from Olean to Millgrove, six miles.
 Canal completed from Rockville to Olean basin.
 Break near Fort Hill, maliciously done, suspends navigation four days.
- 1857 Chapter 247 — Extension to Millgrove to be built for \$109,000.
 Chapter 365 — \$63,142.36 appropriated.
 Rockville to Olean completed, 24 miles, total 117 miles.
 Extension to Millgrove contracted for.
 June 9, and November 10, — Breaks caused by floods; navigation suspended 10 and 4 days, respectively.
 Feeder built from Olean creek, 5 rods.
- 1858 Chapter 329 — \$40,000 appropriated for canal proper and \$61,212.36 for extension.
 Oil creek reservoir completed; 470 acres, dam 46 feet, average depth 25 feet.
- 1859 Chapter 149 — \$17,700 to be raised by taxes.
 About 6 miles of extension completed.
- 1860 Chapter 213 — \$28,365 appropriated for canal; \$28,475 for extension.
- 1861 Chapter 211 — Damages caused by diverting Black creek in constructing canal to be compensated.
 July. — Canal board authorizes construction of a guard-lock near Allegheny river. (Completed same year.)
 September 27. — Freshet so badly injures canal and structures from Mt. Morris to Olean that navigation is suspended for remainder of season.
 December. — Extension to Millgrove completed, 6.7 miles, completing canal.
- 1862 Chapter 137 — \$8,000 reappropriated.
 Chapter 169 — Contracts to be closed September 1.
 Chapter 208 — Bridge to be built at Atkinson St., Rochester.
 April 22. — Survey to be made of Allegheny river.
 Tolls received for season, \$35,921.70, largest amount ever obtained.
- 1863 Chapter 342 — Water in Oil creek reservoir to be raised 3 feet; dam to be built on Ichna creek; dams to be made 5 ft. high on creeks supplying extension.
 Chapter 482 — Bridges to be built at Plymouth Ave., Rochester, State St., Nunda, and at Mt. Morris. (Completed 1864.)
 July 21. — Heavy rains cause much damage to canal, especially between Mt. Morris and Dansville.
- 1864 Chapter 170 — \$85,000 appropriated to make Lime lake a reservoir and rebuild 5 locks in rubble masonry.
 Oil creek reservoir raised 3 ft.; 450 acres.
 Plymouth Ave. bridge, Rochester, rebuilt of iron.
 Ichna feeder dam completed.

- 1864 August 17, — Canadea aqueduct destroyed and great damage done to canal by a severe storm.
- 1865 Chapter 104 — Nuisance at Cuylerville caused by canal leakage to be abated. March 16, 17, 18, — Freshet badly injures canal, Scottsville and Canaseraga creek aqueducts seriously damaged.
- 1866 Chapter 804 — \$64,871.70 reappropriated from chapter 170-1864; also \$6,936.26 added.
Chapter 569 — Bridge to be built at Clay St., Rochester. (Built 1867.)
Locks Nos. 11, 15, 21, 38 and 53 rebuilt of stone.
- 1867 Chapter 281 — Whipple arch truss bridge to be built at Nunda.
Chapter 359 — Iron bridge to be built at Mt. Morris.
Chapter 648 — Whipple iron bridge to be built at Hunter St., Rochester.
Locks Nos. 14, 17, 18 and 30 rebuilt.
- 1868 Chapter 346 — \$7,981.99 reappropriated from chapter 304-1866.
Chapter 583 — State ditch east of and parallel with canal at Groveland and West Sparta to be reopened.
Chapter 715 — \$242,000 appropriated for improving Ischua feeder and aqueduct; widening channel; depressing bottom of guard-lock; removing Mud lock and changing plan of bridges.
- 1869 Chapter 877 — Appropriation for improvement of canal and construction of an iron bridge at Mt. Morris.
Oil creek reservoir raised 4 feet more, 800 acres.
State Engineer recommends additional steam dredge for canal.
- 1870 Chapter 767 — Appropriation for improving canal.
- 1871 Chapter 930 — Appropriation for moving lock No. 44 at Nunda, also for constructing stone abutments and docking at dam, Mt. Morris.
- 1872 Chapter 850 — Waters of Loon lake to be turned into Mill creek, Dansville, to supply water deficiency.
January 1, — Flood in Genesee river sweeps away two spans of the Portage aqueduct.
February 4, — Canal board divides canal into three sections instead of four.
Summit level deepened and Oil creek dam raised 2 feet.
- 1873 Chapter 643 — \$18,537.94 appropriated for canal.
Chapter 766 — Appropriations for bridge over Dansville branch at Woodville.
- 1874 Chapter 399 — Reappropriation of chapter 850-1872 and an additional appropriation for culvert under canal, Rochester.
- 1875 Chapter 17 — Board of Public Works, Rochester, may build a turntable bridge over canal at West Ave., assessing cost on property benefited.
Chapter 499 — Canal board to examine and report as to sale of canal.
Chapter 594 — Appropriation for bridge over canal at Mount Morris.
- 1876 Chapter 382 — Commission appointed to report as to disposition of canal.
Chapter 886 — \$40,000 appropriated for fiscal year.
- 1877 Chapter 404 — Canal to be abandoned September 30, 1878.
- 1878 Chapter 344 — Canal commissioners to sell the canal.
June 25, — Break at Portville, caused by muskrats; navigation delayed 2 days.
- 1879 Chapter 522 — Superintendent of Public Works to sell canal after January 1, 1880.
- 1880 Chapter 326 — Canal between Mt. Morris and Cuba, Mt. Morris and Rochester, Cuba and Olean and Millgrove, may be sold to R. R. Co., \$100 per mile; from Cuba reservoir to Rockville reservoir, from Allen's creek feeder to Rochester, canal reserved.

- 1881 Chapter 157 — Sales of canal property to be advertised.
 Chapter 593 — Sanitary condition of abandoned canal at Groveland and Mount Morris to be improved.
 Chapter 666 — Water to be removed from abandoned canal at Rochester and water from Allen's creek feeder carried across to Genesee river feeder.
- 1882 Chapter 166 — Wiscoy reservoir feeder and Ischua reservoir, Dansville branch, vested in certain parties.
- 1883 Ohio basin, Rochester, extended 500 feet up abandoned canal by permit of Superintendent of Public Works.
- 1887 Chapter 229 — Genesee Valley Canal R. R. Co. to release to Rochester canal lands to West Ave.
- 1889 Chapter 470 — Canal at Wheatlands and Chili to be drained.
 Senate resolution — State Engineer to report whether advisable to repair reserved portion of canal as a feeder to Erie canal.
- 1890 Chapter 96 — Canal to be drained in Pine valley and at Millport.
- 1893 Chapter 399 — Reappropriation for improving sanitary condition of canal at Wheatlands and Chili, pursuant to chapter 470-1889.
- 1895 Chapter 219 — Reappropriation for sanitation of abandoned canal, pursuant to chapter 399-1893.
- 1905 Chapter 722 — Unexpended balance of fund for completion of canal transferred to canal-debt sinking fund.

CHENANGO CANAL EXTENSION.

- 1838 Chapter 292 — Canal commissioners to survey for extension from Binghamton to Tioga Point.
- 1839 J. D. Allen's report; 39 miles; cost about \$770,000.
- 1846 Chapter 259 — Chenango Junction Canal Co. incorporated to build canal from Binghamton to Athens.
- 1859 Chapter 88 — Examination of route ordered, Binghamton to Athens.
- 1860 January 10, — Report on extension; estimated cost \$829,488.21; length 38.48, lockage 71 ft.
- 1863 Chapter 115 — Construction authorized.
- 1864 Chapter 185 — Appropriates \$550,000; locks to be the same size as on the North Branch canal, Pennsylvania.
 Chapter 399 — Additional appropriation for extension of canal.
- 1865 June 22, — Contracts for 10 miles let. New length 40.025 miles.
- 1866 Chapter 794 — Provides for an extra resident engineer for Chenango canal extension.
 Chapter 304 — \$500,251.15 reappropriated from chapter 185-1864.
 Chapter 649 — \$300,000 to be raised by tax.
- 1867 Thirty miles under contract. Work stopped, want of funds.
- 1868 Chapter 346 — \$18,201.15 of chapter 304-1866 reappropriated.
 Chapter 715 — \$281,800 appropriated.
 More funds having been appropriated, work was resumed.
 10 miles of extension completed; 20 miles let.

- 1869 Chapter 877 — Appropriates \$200,000 to pay for work done and to be done.
- 1870 Chapter 787 — Appropriation for canal.
- 1871 Chapter 930 — Appropriation for completing canal, Binghamton to Owego.
- 1872 Work suspended; never resumed.
- 1873 Chapter 835 — Binghamton, Dushore and Williamsport R. R. Co. authorized to lay its tracks on tow-path, south of Susquehanna river, if canal board consents.
October 1, — Canal board consents to provisions of chapter 835-1873.
- 1874 Chapter 607 — Protection wall to be built from Rock Bottom dam, 550 ft. up river on north side.
- 1876 Chapter 382 — Commission appointed to report what disposition should be made of canal.
- 1877 Chapter 404 — Chenango canal extension, with southern part of Chenango canal, to be abandoned after May 1, 1878.
January 19, — Commission under chapter 382-1876 advises that canal be sold.
- 1880 Chapter 551 — State's interests in canal released to adjoining owners.

■ THE BALDWINSVILLE CANAL AND THE SENECA RIVER TOWING-PATH.

- 1809 Chapter 54 — J. C. Baldwin to build dam 7.5 ft. high at McHarry's reef, with lock 77.5x12 ft. for boats of 2 ft. draught; to collect tolls and use surplus waters for 20 years.
- 1817 Chapter 252 — Geddes appointed to report on locks and dams.
- 1818 Geddes reports structures defective, but about to be repaired.
- 1810 Baldwin conveys interests to sons.
- 1827 Chapter 192 — Baldwin's rights extended twenty-one years.
- 1831 Guard-lock built at dam and 10-ft. lift-lock at lower end, each 90x15 ft.; canal 0.75 mile long.
- 1836 Chapter 303 — \$4,000 appropriated for towing-path from Mud lock to Baldwinsville.
Chapter 443 — Commissioners to report on practicability of steamboat channel, 60 ft. base, 4.5 ft. deep. (Nothing done.)
- 1838 Chapter 306 — \$15,000 allowed for towing-path, chapter 303-1836.
- 1839. Towing-path completed, 5.36 miles; cost \$14,864.26.
- 1849 Baldwin denied extension of time and bill reported to take possession of lock and canal.
- 1850 Chapter 21 — Rights under chapter 54-1809 extended 30 days.
Chapter 99 — Rights under chapter 54-1809 extended another 30 days.
Chapter 153 — Commissioners to take possession of canal, dam and lock and extend navigation to deep water above dam; also to set monuments fixing height of dam, which is not to be raised higher; rights under chapter 54-1809 extended until State acquires all rights.
State assumes possession of canal.
- 1851 Stone monuments set, fixing height of Baldwinsville dam.
- 1853 Lock at Baldwinsville rebuilt and navigation extended to Jack's reef, 11.75 miles.

- 1854 Chapter 333 — Canal placed under control of canal board.
- 1862 Canal board decides that as canal was acquired since Constitution of 1846 it is not entitled to State maintenance.
- 1863 Chapter 479 — \$26,000 appropriated to rebuild locks at Baldwinsville.
- 1865 Chapter 626 — Settlement to be made with contractor on abandoned locks.
- 1866 Guard-gate at dam completed, cost \$10,985.70, built of stone.
- 1867 Chapter 579 — Appropriation for construction of a guard-gate at Baldwinsville. (Award by canal appraisers.)
- 1869 Chapter 677 — Baldwinsville dam to be built of stone, when rebuilt.
Chapter 877 — Iron bridge to be built over canal at Baldwinsville.
- 1870 Chapter 767 — Appropriation for rebuilding dam at Baldwinsville. (Nothing done.)
- 1871 Towing-path, one-half mile long, built near Onondaga outlet.
- 1872 Chapter 827 — Act for improvement of navigation on Baldwinsville canal.
- 1888 Towing-path from Baldwinsville to Jack's reef abandoned by disuse.
- 1891 Lift-lock partly rebuilt.
- 1893 Chapter 113 — Appropriation for construction of stone dam across Seneca river at Baldwinsville.
- 1894 Chapter 130 — Additional appropriation for completing stone dam at Baldwinsville as per chapter 113-1893.
Stone dam at Baldwinsville completed, pursuant to chapters 113-1893 and 130-1894.
- 1904 Float-bridge at Baldwinsville rebuilt.

ONEIDA RIVER IMPROVEMENT.

- 1808 James Geddes to survey between Ontario and Oneida lakes.
- 1809 Geddes' report, Oneida lake to Three River Point, 18 miles, fall 12.5 ft.
- 1824 Chapter 298 — Privilege given G. Jewell to build wing dam at Caughdenia (Caughdenoy) reef.
- 1828 Chapter 229 — Canal commissioners to lower Oneida lake; J. Porter to construct dam and lock at Caughanoy (Caughdenoy); G. C. Schroepel, a dam and lock at Oak Orchard.
- 1829 Chapter 333 — Commissioners to remove Caughanoy (Caughdenoy) dam. Dam removed and lake lowered.
- 1830 Commissioners' estimate for lowering Oneida outlet, \$86,398.34 for canal-boat navigation; \$59,923.10 for steamboats.
O. W. Child's report, Oneida river, 19.25 miles, fall 9.6 ft.
- 1836 Chapter 443 — Commissioners to report on practicability of steamboat channel, 60 ft. base, 4.5 ft. deep. (Nothing done.)
- 1838 Chapter 284 — Commissioners to survey river and report cost of improvement by locks and short canals, 4.5 ft. deep.
- 1839 Favorable report by O. W. Childs.
Chapter 284 — \$75,000 authorized for securing steamboat navigation.
Contracts let and work begun.

- 1840 Oak Orchard lock completed.
- 1841 Oak Orchard dam completed.
Caughdenoy lock completed.
- 1843 Navigation open from Three River Point to Caughdenoy.
- 1846 Chapter 325 — \$500 appropriated for preserve work.
- 1847 Chapter 261 — \$20,000 appropriated to complete river improvement.
- 1849 Chapter 221 — Renews chapter 261-1847.
- 1850 Chapter 267 — Draw-bridge to be built at Oak Orchard. (Completed 1850.)
Navigation commenced by steamers.
- 1851 Chapter 407 — Renews chapter 261-1847.
- 1855 Chapter 531 — Renews chapter 261-1847.
- 1866 Chapter 776 — Canal commissioners to take charge of draw-bridge at Caughdenoy.
Chapter 896 — Schroeppel's bridge to be replaced with draw-bridge. (Completed 1867.)
- 1874 Chapter 399 — \$100,000 appropriated for lowering locks and deepening channel.
- 1883 Superintendent of Public Works recommends abandonment of route.
- 1889 Chapter 568 — \$10,000 appropriated for deepening river by raising dams at Oak Orchard and Caughdenoy and by dredging channel.

CAYUGA (MONTEZUMA) MARSHES.

- 1809 January 20, — James Geddes speaks of the "immense tract of alluvial soil" to be gained by draining Cayuga marshes.
- 1821 February 16, — Assembly resolution that canal commissioners cause a survey to be made of Seneca river with a view of lowering Jack's reef.
- 1824 Chapter 168 — Commissioners to survey Seneca river from Jack's reef to Cayuga lake.
- 1825 January 29, — Report of survey by David Thomas under chapter 168-1824, estimating cost of draining Cayuga marshes at \$125,000.
Chapter 208 — \$80,000 appropriated for draining marshes, and three commissioners appointed to supervise work.
June 22, — Work of draining marshes let at 24 cents per cubic yard.
- 1826 Chapter 257 — Amending chapter 208-1825, defines powers of commissioners and appoints David Thomas, engineer.
February 2, — Contracts for draining marshes relet at 35 cents per cubic yard.
- 1828 Chapter 292 — \$20,000 additional appropriated for draining marshes.
March 14, — Report of commissioners for draining of Cayuga marshes.
- 1829 Chapter 322 — Authorizes survey to be made for the drainage of marshes.
Channel around Jack's reef completed, 264 rods long, 40 feet wide and averaging 24 feet deep, lowering water between 4 and 5 feet at Cross lake and 1½ feet at Montezuma.
- 1830 February 10, — Petitions of inhabitants of Mentz, Cayuga county, relating to expenditures of drainage commissioners; referred to Comptroller.
February 17, — Comptroller reports concerning petitions relating to the accounts of drainage commissioners.

- 1830 March 17. — Drainage commissioners report progress and request further appropriations.
Chapter 326 — Comptroller to investigate accounts of drainage commissioners.
- 1831 Chapter 322 — Seneca river below Cayuga lake, down to Jack's reef, to be surveyed and estimates made of benefit to lands reclaimed through drainage of marshes.
January 27. — Comptroller reports under chapter 326-1830, concerning accounts of drainage commissioners.
March 3. — Drainage commissioners render further report of progress and urge necessity for additional appropriation.
March 7. — Select committee of Assembly recommends additional appropriation of \$25,000 for draining marshes.
April 12. — Report of select committee of the Assembly upon Comptroller's report under chapter 326-1830, advises that matter be referred to Attorney-General.
April 13. — Concurrent resolution requires Attorney-General to proceed against drainage commissioners, to recover any sums for which they may be accountable.
- 1832 Chapter 282 — Continues in force for one year provisions of chapter 322-1831, relative to drainage of marshes.
January 7. — Attorney-General reports under concurrent resolution of April 13, 1831, *in re* the drainage commissioners.
June 25. — Canal commissioners report under chapters 332-1831 and 282-1832.
December 30. — Report of James Geddes concerning the drainage of Cayuga marshes.
- 1840 Committee on claims report in favor of paying claim of Noah Briggs for damages caused by draining marshes.
Chapter 149 — Appropriation for payment of claim of Noah Briggs.
- 1851 Chapter 503 — Commissioners appointed to examine Cayuga marshes and Seneca river for purpose of drainage.
December 31. — Report of George Geddes on draining Cayuga marshes, giving distances and descents.
- 1852 February 12. — Commissioners report, pursuant to chapter 503-1851, and advise drainage of Cayuga marshes.
- 1853 Chapter 178 — Cayuga marshes to be drained, \$100,000 appropriated.
February 17. — Exhaustive report of Senate committee, relative to drainage of Cayuga marshes.
- 1855 Chapter 539 — Appropriates unexpended balance for draining marshes.
December 26. — George Geddes, engineer in charge, reports that \$60,000 will be needed to complete drainage of marshes.
- 1856 Chapter 185 — Canal commissioners to pass on claim of contractor for increased compensation for draining marshes.
- 1856 Erie canal aqueduct completed across the Cayuga marshes.
- 1857 Chapter 541 — \$55,000 appropriated for draining Cayuga marshes.
Chapter 95 — \$25,000 additional appropriation for draining marshes.
Jack's reef cut through, lowering Cross lake four feet; cost \$169,000.
- 1858 Chapter 179 — Commissioners to remove obstructions in outlet of Cayuga lake and channel of Seneca river, also to dredge above and below aqueduct across river.
- 1859 Chapter 500 — Appropriates \$13,380.53, unexpended balance for draining marshes.

- 1860 Chapter 412 — \$30,000 appropriated to complete drainage of marshes.
March 3, — Report of State Engineer, concerning drainage of Cayuga marshes,
in answer to legislative inquiry.
- 1861 Chapter 266 — Reappropriates \$5,623, unexpended balance for draining
marshes, pursuant to chapter 178-1853.
- 1862 Engineer reports that \$227,727 has been spent on drainage of marshes and
that about \$300,000 would be required to complete work.
- 1865 Chapter 621 — \$3,000 appropriated for rebuilding bridge over State ditch at
Jack's reef.
- 1867 Chapter 844 — Iron bridge to be built over State ditch, Jack's reef.
- 1868 Chapter 520 — Canal appraisers to determine certain claims for damages said
to have been caused by draining Cayuga marshes.
- 1869 Chapter 761 — Canal appraisers to determine certain claims for damages
caused by Jack's reef improvement.

HUDSON RIVER.

- 1648 March 10, — Ordinance passed by Director-General and Council; navigation
of river forbidden, unless license be obtained.
- 1660 July 2, — Ordinance passed; renews ordinance of March 10, 1648.
- 1664 July 17, — Ordinance passed; sloops forbidden to navigate river, except in
pairs.
- 1792 Chapter 6 — Channel not to be obstructed at Albany.
Chapter 8 — All dams in Hudson river to have flood-gates and fishways.
- 1796 Chapter 40 — Northern Lock Navigation Co. to examine river from Albany to
Mill creek; State to pay $\frac{1}{2}$ of cost if 6 ft. of water can be got for £6,000.
- 1797 Chapter 39 — Appropriates \$7,500 for pile dykes across island channel, op-
posite J. L. Whitbeck's mill.
- 1799 Chapter 11 — Dam to be built in place of dyke authorized by chapter 39-1797.
Chapter 20 — Commissioners appointed to improve river between Troy and
Lansingburg; to tax property \$8,400.
- 1800 Chapter 25 — Commissioners appointed to improve river, Lansingburg to
Waterford and Albany to Troy; to raise \$13,000 by lottery.
- 1801 Chapter 12 — \$5,000 to be raised by lottery for improvement.
Chapter 68 — River from Waterford to Stillwater to be deepened; dams not to
be removed.
Chapter 157 — \$10,000 to be raised by lottery for improvement.
- 1803 Chapter 68 — \$15,000 to be raised by lottery for work near Troy; \$8,000
for work, Albany to Nicoll's creek.
- 1804 Canal of 12 $\frac{1}{2}$ miles from Albany to New Baltimore proposed by General Genet.
Chapter 67 — \$20,000 to be raised by lottery for river improvement, Troy to
Waterford.
- 1807 Chapter 171 — \$27,500 to be raised by lottery for improvement.
- 1808 Survey to be made for dam near Troy.
- 1809 January 20, — Prescott's report, favoring dam.
- 1810 Chapter 183 — \$30,000 to be raised by lottery for river improvement, Troy to
Waterford.

- 1812 Chapter 157 — Troy to improve river to Albany and to receive all money; \$10,000 appropriated for improvement, Albany to Coeymans.
- 1815 Chapter 260 — Sole commissioner appointed for improvement of river, Troy to Coeymans.
- 1816 Chapter 37 — Sole commissioner having declined, three commissioners appointed to carry out provisions of chapter 260-1815.
- 1817 Chapter 196 — Commissioners appointed to explore river and decide upon improvements; Troy dam may be extended across the river and lock built.
- 1818 Chapter 278 — Treasurer to pay commissioners all unexpended appropriations.
- 1819 Chapter 120 — Troy to build dam from Fish House island to east shore.
Chapter 152 — Seven commissioners appointed to present estimates for improving navigation of tide-waters.
First hydrographic survey, Troy to New Baltimore, by John Randall.
- 1820 Canal from Albany to New Baltimore recommended by commission, of which De Witt Clinton was chairman.
- 1821 Chapter 78 — Unexpended balances to be applied to Troy dam.
- 1823 Chapter 111 — Basin to be built at Albany.
Canal from Albany to New Baltimore advised by Benjamin Wright.
Troy dam and lock completed.
- 1827 Chapter 296 — \$14,000 appropriated for dredging between Troy dam and Coeymans.
- 1831 Hydrographic survey, Waterford to New Baltimore, by Col. De Witt Clinton, under Government authority.
- 1832 Col. Clinton reports to War Department.
- 1834 Chapter 240 — Canal commissioners to survey river, Troy to New Baltimore, also for ship canal route, Greenbush to New Baltimore, on plan suggested by E. C. Genet in 1820; 12.75 miles, 35 ft. wide, 18 ft. deep.
Congress appropriates \$70,000 under advice of Col. De Witt Clinton.
- 1835 Chapter 163 — Albany to improve basin.
Chapter 229 — United States to occupy lands necessary to improvement.
Channel instead of canal advised by U. S. engineers.
- 1836 Chapter 139 — Albany basin to be improved.
- 1837 Chapter 467 — Albany basin to be improved.
220 feet of Troy dam carried away.
- 1839 Chapter 29 — Land ceded to United States for lighthouse at Esopus.
Chapter 323 — Canal board to survey canal route up river from Corinth to Johnsburg and Northampton.
- 1840 Chapter 95 — Obstruction near Van Wies Point to be removed.
450 feet of Troy dam carried away.
- 1843 Survey Troy to New Baltimore by Captain S. W. Hughes.
- 1849 Chapter 390 — Land ceded to United States for a beacon at Tarrytown.
Chapter 406 — Channel to be cleared, Glens Falls feeder to Hadley, and Phelps bay to Sacondaga.
- 1852 Chapter 365 — Obstructions to be removed at Castleton; appropriation, \$10,000.
- 1853 Chapter 190 — Albany and New Baltimore Ship Canal and Basin Co. incorporated.

- 1853 Report of W. J. McAlpine on canal, Albany to New Baltimore; surface 20 ft. water; 2 locks 300x50 and 215x30 ft.
- 1854 Troy sloop lock rebuilt.
- 1856 Hudson River Bridge Co. at Albany incorporated.
- 1857 Chapter 374 — \$25,000 appropriated to remove obstructions, Troy to New Baltimore.
- 1858 Chapter 361 — River opposite Troy to be dredged to 8 feet.
- 1860 Chapter 20 — Persons cutting ice in the river to erect safety fences.
- 1861 Chapter 313 — United States to build 3 beacons between Troy and Albany. Coast survey triangulation of river completed.
- 1863 Chapter 122 — \$100,000 appropriated for improvement, Troy to New Baltimore.
Coeymans dyke built, 2,940 ft.; Castleton dyke built, 8,370 ft.
- 1864 Chapter 105 — River to be improved, Troy to New Baltimore, and Catskill creek deepened; appropriation, \$134,326.63.
Chapter 243 — Bridge at Albany to be 20 ft. above ordinary tide.
February 4, — Report of commissioners; channel at mean low tide is 7½ feet; only 4 ft. in 1819; jetties at Coeymans and Castleton secure 10 feet of water.
Pittaway dyke built, 2,907 ft.; 5½ miles south of Albany.
Castleton dyke built, 2,960 ft.; 9 miles south of Albany.
- 1865 Chapter 472 — Survey to be made to determine feasibility of slack-water navigation, Waterford to Fort Edward.
Chapter 561 — Appropriates \$125,000 to continue improvements, Troy to New Baltimore.
Greenbush dyke begun, 3,086 ft.; one-half mile south of Albany.
Cuyler's bar dyke built, 3,413 ft. (not entirely finished), and channel improved at an expense of \$92,927, pursuant to chapter 561-1865.
- 1866 Chapter 33 — Survey of river to be made for slack-water navigation, Troy to Fort Edward, locks 225x25 ft. and stone dams.
Chapter 491 — Work under chapter 561-1865 to continue, \$150,000 appropriated.
Chapter 503 — \$35,000 appropriated for improvement of Albany basin.
Willow island dyke built, near New Baltimore, 4,507 ft.
Schodack dyke built, 924 ft.; Cuyler's dyke completed.
Coeymans dyke extended 460 ft.; Greenbush dyke completed.
Commissioners report: loss of tide, —Stuyvesant to Albany, 24 miles, 18 inches; Stuyvesant to New York, 78 miles, 5 inches; plan of work, Troy to New Baltimore, 8 ft. at low water.
- 1867 Chapter 579 — \$10,000 appropriated for improvement at Troy.
Chapter 647 — \$150,000 appropriated to continue improvements, Troy to Cox-sackie.
Mills light dyke built, 3,628 ft.; 10 miles south of Albany.
New Baltimore dyke built, 6,470 ft.; 14 miles south of Albany.
February 13, — Report on slack-water navigation; Troy to Fort Edward, 39.9 miles, 116 ft. rise; 8 ft. water; 11 locks 225x25 ft.; 11 stone dams; estimate, \$2,360,079.
- 1868 Chapter 231 — \$12,000 appropriated for repairs to Troy dam.
Chapter 332 — Hudson, Highland Suspension Bridge Co. incorporated to build bridge from Verplanck's Point to Buttermilk falls.
Chapter 412 — Hudson River Bridge Co. to construct bridge over the Hudson at Albany to foot of Exchange St., and to remove present bridge.

- 1849 Chapter 32 — \$20,000 appropriated to repair Albany basin.
 Chapter 779 — Hudson River Bridge Co. may construct another bridge across the Hudson between State St. and Maiden lane.
 Chapter 877 — \$45,000 appropriated for rebuilding Troy dam.
- 1870 Chapter 555 — Canal commissioners to construct fishways at Troy dam.
- 1871 Chapter 268 — Contributory appropriation for construction of a bridge over river between Warrensburg and Thurman.
 Chapter 312 — Fulsome Landing Bridge Company may complete its bridge over river between Chester and Johnsburg.
 Chapter 458 — Provisions for extension of Rondout and Oswego R. R. to east bank of river; also establishment of a steam ferry.
 Chapter 897 — Poughkeepsie Bridge Company incorporated.
- 1872 Chapter 269 — Albany and Greenbush Bridge Co. incorporated.
 Chapter 310 — Troy and West Troy Bridge Company incorporated.
 Chapter 321 — Troy, Lansingburg and Cohoes Bridge Co. incorporated.
 Chapter 346 — River to be dredged between Troy and Coxsackie.
 Chapter 546 — Mechanicville Bridge Co. incorporated.
- 1873 Chapter 713 — Appropriates \$50,000 for improvement of river navigation.
- 1875 Chapter 403 — Supplementary to chapter 332-1868, concerning the Hudson, Highland Suspension Bridge Co.
- 1876 Chapter 204 — \$40,000 appropriated for State Engineer to improve river between Troy and Coxsackie; to secure 5 ft. water, below Troy sloop lock; 6 ft. water, 125 ft. wide, between Troy and Albany; 10 ft. water, 125 ft. wide, between Albany and Coxsackie.
 Chapter 376 — Dumping in river forbidden.
 136,709 cubic yards dredged from the river.
- 1877 Chapter 275 — Commissioners appointed to establish bulkhead lines in the river.
 Chapter 346 — Amending chapter 269-1872, the act incorporating Albany and Greenbush Bridge Co.
 Chapter 412 — \$15,000 appropriated for State Engineer to improve river from Troy to Coxsackie; to secure from State dam to Troy bridge, 5 ft. water, 60 ft. wide; to the lower Albany bridge, 7 ft. water, 125 ft. wide; to Coxsackie, 10 ft. water, 150 ft. wide.
 January 31, — Lieut. Willard, U. S. A., reports depth at mean low water: Bogart light, 8.6; Overslaugh dam, 8.1; Coeymans, 8.2; New Baltimore, 8.8.
 226,842 cubic yards dredged from the river.
- 1878 Chapter 39 — Time for completing Poughkeepsie bridge extended to 1881.
 Chapter 205 — Appropriates \$30,000 for improvement of river navigation, as per chapter 412-1877.
 211,654 cubic yards dredged from river.
- 1879 Chapter 106 — \$30,000 appropriated for State Engineer to improve the river from Troy to Coxsackie; to secure from State dam to Troy R. R. bridge 5 ft. water, 60 ft. wide; to the lower Albany R. R. bridge, 8 ft. water, 125 ft. wide; to Coxsackie, 10 ft. water, 150 ft. wide.
 Chapter 388 — Adjoining owners to have first right to cut ice to center of river.
 114,197 cubic yards dredged from the river.
- 1880 Chapter 50 — Time for completing Poughkeepsie bridge extended three years.
 Chapter 51 — \$30,000 appropriated for State Engineer to improve river from Troy to Coxsackie, as per chapter 106-1879.
 Chapter 541 — Lights to be maintained on all Hudson river swing-bridges.
- 1881 Chapter 230 — \$30,000 appropriated for State Engineer to improve river, Troy to Coxsackie, as per chapter 106-1879.

- 1882 Chapter 77 — Time for completion of Poughkeepsie bridge extended to 1888.
Chapter 372 — \$30,000 appropriated for State Engineer to improve river, Troy to Coxsackie, as per chapter 106-1878, also West Troy side-cut.
- 1883 Chapter 223 — Land ceded to United States for lighthouses at Danskammer Point and Narrow Channel.
Chapter 451 — \$30,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie; to secure railroad from bridge at Troy to lower railroad bridge, Albany, 8 ft. water, 125 ft. wide; to Coxsackie 10 ft. water, 150 ft. wide.
- 1884 Chapter 110 — \$30,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 451-1883.
Chapter 273 — Land to be ceded to the United States for lighthouses on river.
Chapter 541 — Governor to appoint commission to report on storing head waters of Hudson river.
115,897 cubic yards dredged from the river.
- 1885 Chapter 210 — \$30,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie: to secure from Troy dam to Troy R. R. bridge, 6 ft. water, 80 ft. wide; to the lower Albany R. R. bridge, 8 ft. water, 125 ft. wide; to Coxsackie, 10 ft. water, 150 ft. wide.
187,340 cubic yards dredged from river.
- 1886 Chapter 172 — \$25,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 210-1885.
104,000 cubic yards dredged from river; dyke built at New Baltimore, 1,000 feet long.
- 1887 Chapter 162 — \$30,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 210-1885.
Chapter 512 — Fishway to be constructed in Troy dam.
118,958 cubic yards dredged from the river.
- 1888 Chapter 173 — \$50,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie; to secure from Troy dam to Troy railroad bridge, 6 ft. water, 80 ft. wide; to the lower R. R. bridge, Albany, 10 ft. water, 140 ft. wide; to Coxsackie, 11 ft. water, 175 ft. wide.
195,414 cubic yards dredged from river.
- 1889 Chapter 106 — \$50,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 173-1888.
Chapter 278 — Mole to be constructed at McCabe, Houghtaling island.
178,148 cubic yards dredged from river.
Chapter 204 — \$30,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 173-1888.
Chapter 501 — Troy and Breaker Island Bridge Co. incorporated.
March 25, — Pier lines approved by Secretary of War, Troy to New Baltimore.
82,812 cubic yards dredged from the river.
- 1891 United States Government assumes charge of the river; no appropriation by the State.
- 1892 Chapter 155 — State Engineer to report condition of State dams at Troy and Cohoes.
Chapter 158 — Alteration of pier head line in New York City.
Chapter 281 — Albany and Bath-on-the-Hudson Bridge Co. incorporated.
Chapter 293 — \$35,000 appropriated for Superintendent of Public Works to improve river, Troy to Coxsackie, as per chapter 173-1888.
Chapter 607 — For improvement of west channel of river between New Baltimore and Coxsackie.
123,609 cubic yards dredged from the river.

- 1893 Chapter 35 — For improving lateral channels and repairing certain dykes in the river.
\$1,520,249 spent in dredging the river between Troy and Coxsackie since 1797.
- 1894 Chapter 353 — For completing the mole between river and Houghtaling island.
Chapter 374 — Provides for construction of free bridges over river at Still-water.
- 1895 Chapter 97 — For a commission to confer with representatives of New Jersey concerning the acquisition by the United States of the Palisades.
Chapter 599 — For a survey of upper Hudson river valley, with a view to store waters for improving navigation on Champlain canal and lower Hudson.
Chapter 953 — To regulate the cutting and harvesting of ice in river.
Chapter 982 — Bulkhead and pier lines established at Albany.
- 1896 Chapter 15 — Palisades in Rockland County ceded to United States for a National park.
Chapter 320 — Supplementing chapter 599-1895, provides for continuation of survey of upper Hudson river valley.
Chapter 950 — Additional appropriation for completing mole between river and Houghtaling island, pursuant to chapter 278-1889.
- 1897 Chapter 560 — Appropriation for removal of part of pier at Piermont, Rockland County.
Chapter 567 — Authorizes Superintendent of Public Works to purchase the Fort Miller bridge near State dam, Northumberland.
Chapter 592 — Regulations concerning navigation of Hudson river.
- 1898 Chapter 201 — Amending chapter 560-1897 authorizing the removal of a part of the dock at Piermont.
Chapter 552 — Reappropriates unexpended balance for completing mole between river and Houghtaling island, pursuant to chapter 950-1896.
- 1899 Chapter 264 — Amending chapter 953-1895, regulates the cutting and harvesting of ice in Hudson river.
Chapter 569 — Appropriation for completing the mole between the river and Houghtaling island.
- 1900 Chapter 33 — Authorizes Hudson River Water Power Co. to build and maintain a dam across river between Glens Falls and Palmer's Falls.
Chapter 170 — To provide for an Interstate Park along the Palisades.
Chapter 175 — The dam erected and maintained across river near Mechanicville by Hudson River Power Transmission Co. legalized.
- 1901 Chapter 164 — Waterford Electric Light Co., may construct and maintain a dam across river between Half Moon and Schaghticoke.
Chapter 541 — Part of Esopus island to be conveyed and jurisdiction ceded to the United States.
Chapter 669 — Construction of a dam across the river to Warren County authorized.
- 1904 Chapter 104 — Extending time for completion of the Hudson Suspension Bridge and N. E. R. R. Co.'s bridge over the river between Verplanck's Point and Buttermilk falls, 10 years.
Chapter 749 — Amending chapter 953-1895, regulates the harvesting of ice in river.

SHINNECOCK AND PECONIC CANAL.

- 1826 Report of survey by Holmes Hutchinson.
- 1828 April 15, — Long Island Canal Co. incorporated. (Nothing done.)
- 1848 April 8, — Long Island Canal and Navigation Co. incorporated. (Nothing done.)

- 1879 May, — Concurrent resolution requiring State Engineer to make surveys for canal connecting Shinnecock and Peconic bays.
- 1880 April 7, — State Engineer reports, approving Hutchinson's plans; estimates cost at \$35,000.
- 1884 Chapter 508 — Superintendent of Public Works to build a canal between Shinnecock and Peconic bays; \$12,000 appropriated; canal to be maintained at expense of Suffolk County.
- 1885 Chapter 525 — Additional appropriation for canal.
- 1886 Chapter 380 — Additional appropriation for canal.
- 1887 Chapter 460 — Additional appropriation to complete canal.
Chapter 628 — Town trustees, Southampton, may provide an inlet from ocean to Shinnecock bay.
- 1888 Chapter 270 — Appropriation for improving channel and extending piers of canal.
- 1890 Chapter 436 — Reappropriates unexpended balances, pursuant to chapters 460-1887, 270-1888 and 508-1884.
- 1891 Chapter 302 — Additional appropriation for completing canal.
- 1892 Chapter 356 — Appropriation for completing canal.
Canal completed; cost, about \$98,000.
Oyster industry restored; \$100,000 worth of oysters taken from Shinnecock bay during the season.
- 1893 Chapter 726 — For removal of bars and protecting banks of canal.
Chapter 726 — For restoring and protecting approaches to swing-bridge over canal.
- 1894 Chapter 858 — Additional appropriation for restoring and protecting approaches to swing-bridge, pursuant to chapter 726-1893.
Chapter 768 — Additional appropriation for protecting banks. (Completed December, 1894.)
- 1895 Chapter 932 — Appropriates \$18,000 for improvements to canal—tide-gates and inlet to ocean.
- 1896 Chapter 348 — Appropriation for excavating channel between Shinnecock and Great South bays.
Chapter 950 — Additional appropriation for tide-gates and inlet.
Tide-gates completed.
- 1897 Chapter 790 — Additional appropriation for channel between Shinnecock and Great South bays.
Chapter 791 — Appropriation for repairing and maintaining tide-gates and for piling.
- 1898 Chapter 207 — Appropriation to complete channel between Shinnecock and Great South bays.
- 1899 Chapter 569 — Appropriation for paying balance on repairs to canal.
Channel between Shinnecock and Great South bays completed.
- 1900 Chapter 419 — Appropriates \$30,000 for improving canal.
- 1902 Improvements provided for by chapter 419-1900 completed; tide-gates rebuilt, bars dredged.

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